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Cochrane Database of Systematic Reviews 2020, Issue 11. Art. No.: CD001159.
DOI: [10.1002/14651858.CD001159.pub3](https://doi.org/10.1002/14651858.CD001159.pub3).

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[Intervention Review]

Peripheral nerve blocks for hip fractures in adults

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Contact address: Joanne Guay, joanneguay@bell.net.**Editorial group:** Cochrane Anaesthesia Group.**Publication status and date:** Edited (no change to conclusions), published in Issue 4, 2021.**Citation:** Guay J, Kopp S. Peripheral nerve blocks for hip fractures in adults. *Cochrane Database of Systematic Reviews* 2020, Issue 11. Art. No.: CD001159. DOI: [10.1002/14651858.CD001159.pub3](https://doi.org/10.1002/14651858.CD001159.pub3).

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ABSTRACT

Background

This review was published originally in 1999 and was updated in 2001, 2002, 2009, 2017, and 2020. Updating was deemed necessary due to the high incidence of hip fractures, the large number of official societies providing recommendations on this condition, the possibility that perioperative peripheral nerve blocks (PNBs) may improve patient outcomes, and the major role that PNBs may play in reducing preoperative and postoperative opioid use for analgesia.

Objectives

To compare PNBs used as preoperative analgesia, as postoperative analgesia, or as a supplement to general anaesthesia versus no nerve block (or sham block) for adults with hip fracture. Outcomes were pain on movement at 30 minutes after block placement, acute confusional state, myocardial infarction, chest infection, death, time to first mobilization, and costs of an analgesic regimen for single-injection blocks.

We undertook the update to look for new studies and to update the methods to reflect Cochrane standards.

Search methods

For the updated review, we searched the following databases: the Cochrane Central Register of Controlled Trials (CENTRAL; 2019, Issue 11), in the Cochrane Library; MEDLINE (Ovid SP, 1966 to November 2019); Embase (Ovid SP, 1974 to November 2019); and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (EBSCO, 1982 to November 2019), as well as trial registers and reference lists of relevant articles.

Selection criteria

We included randomized controlled trials (RCTs) assessing use of PNBs compared with no nerve block (or sham block) as part of the care provided for adults 16 years of age and older with hip fracture.

Data collection and analysis

Two review authors independently screened new trials for inclusion, assessed trial quality using the Cochrane Risk of Bias-2 tool, and extracted data. When appropriate, we pooled results of outcome measures. We rated the certainty of evidence using the GRADE approach.

Main results

We included 49 trials (3061 participants; 1553 randomized to PNBs and 1508 to no nerve block (or sham block)). For this update, we added 18 new trials. Trials were published from 1981 to 2020. Trialists followed participants for periods ranging from 5 minutes to 12 months. The

average age of participants ranged from 59 to 89 years. People with dementia were often excluded from the included trials. Additional analgesia was available for all participants.

Results of 11 trials with 503 participants show that PNBs reduced pain on movement within 30 minutes of block placement (standardized mean difference (SMD) -1.05, 95% confidence interval (CI) -1.25 to -0.86; equivalent to -2.5 on a scale from 0 to 10; high-certainty evidence). Effect size was proportionate to the concentration of local anaesthetic used ($P = 0.0003$). Based on 13 trials with 1072 participants, PNBs reduce the risk of acute confusional state (risk ratio (RR) 0.67, 95% CI 0.50 to 0.90; number needed to treat for an additional beneficial outcome (NNTB) 12, 95% CI 7 to 47; high-certainty evidence). For myocardial infarction, there were no events in one trial with 31 participants (RR not estimable; low-certainty evidence). From three trials with 131 participants, PNBs probably reduce the risk for chest infection (RR 0.41, 95% CI 0.19 to 0.89; NNTB 7, 95% CI 5 to 72; moderate-certainty evidence). Based on 11 trials with 617 participants, the effects of PNBs on mortality within six months are uncertain due to very serious imprecision (RR 0.87, 95% CI 0.47 to 1.60; low-certainty evidence). From three trials with 208 participants, PNBs likely reduce time to first mobilization (mean difference (MD) -10.80 hours, 95% CI -12.83 to -8.77 hours; moderate-certainty evidence). One trial with 75 participants indicated there may be a small reduction in the cost of analgesic drugs with a single-injection PNB (MD -4.40 euros, 95% CI -4.84 to -3.96 euros; low-certainty evidence).

We identified 29 ongoing trials, of which 15 were first posted or at least were last updated after 1 January 2018.

Authors' conclusions

PNBs reduce pain on movement within 30 minutes after block placement, risk of acute confusional state, and probably also reduce the risk of chest infection and time to first mobilization. There may be a small reduction in the cost of analgesic drugs for single-injection PNB. We did not find a difference for myocardial infarction and mortality, but the numbers of participants included for these two outcomes were insufficient. Although randomized clinical trials may not be the best way to establish risks associated with an intervention, our review confirms low risks of permanent injury associated with PNBs, as found by others.

Some trials are ongoing, but it is unclear whether any further RCTs should be registered, given the benefits found. Good-quality non-randomized trials with appropriate sample size may help to clarify the potential effects of PNBs on myocardial infarction and mortality.

PLAIN LANGUAGE SUMMARY

Do local anaesthetic nerve blocks provide effective pain relief for adults with a hip fracture?

What is a peripheral nerve block?

A peripheral nerve block (PNB) is an injection of local anaesthetic close to nerves to block pain signals to the brain. PNBs can be used alone or together with other pain relief medicines. They may be given as a single injection or continuously, using a catheter (drip).

Why is this question important?

Hip fractures commonly occur in older people. Surgery is usually needed to repair the bone. Hip fractures are very painful. Opioids such as morphine, which are strong painkillers, are often used to manage hip fracture pain. Older people do not tolerate high doses of opioids well. Also, people with hip fracture may have complications such as confusion, myocardial infarction and chest infection.

By reducing the use of opioids and better treating pain, PNBs may improve the mobility of people with hip fracture and reduce risks of complications.

What did we want to find out?

We wanted to know whether using PNBs compared to no nerve block (no block at all or a placebo nerve block), in people with hip fracture could reduce:

- pain on movement;
- confusion, myocardial infarction, and chest infection;
- death from any cause within six months;
- length of time until people were mobile after surgery; and
- costs of drugs used to manage pain.

What did we do?

We searched medical databases for studies that investigated the use of PNBs versus no effective nerve block (i.e. no block at all or a placebo block) for pain in people with hip fracture. Study participants had to be over 16 years of age and had to have a hip fracture. We looked for randomized controlled trials (RCTs), where the treatment people receive is decided randomly.

What we found

We included 49 studies with 3061 participants (average age 59 to 89 years); 1553 participants received PNBs and 1508 received no nerve block. Additional pain relief, including opioids, was available for all participants when required. Studies were conducted in various countries and published between 1980 and 2020. Twenty-six studies received non-commercial funding, and the source of funding was not stated for the other studies.

Main results

PNBs reduced pain on movement by 2.5 on a scale of 1 to 10, compared with no nerve block (11 studies, 503 participants). PNBs reduced the risk of confusion; for every 12 people with a hip fracture, one person less will become confused with PNBs (13 studies, 1072 participants). We did not find a difference in risk of myocardial infarction (1 study, 31 participants).

PNBs probably reduce the risk of chest infection (3 studies, 131 participants) and time to first mobilization after surgery by 11 hours (3 studies, 208 participants). We did not find a difference in deaths from any cause within six months (11 studies, 617 participants). Costs of drugs used for pain management were slightly lower when a single-injection PNB was compared to no PNB (1 study, 75 participants).

How reliable are the results?

Our confidence (certainty) in the evidence for reduced pain on movement and for reduced confusion was high; we are moderately confident in the evidence for reduced chest infection. However, we are less confident about the evidence for myocardial infarction, death, time to first mobilization, and costs of drugs used for pain management, mainly because this evidence came from small studies with few participants.

What does this mean?

We found enough good-quality evidence to support the use of PNBs in patients with hip fracture. Larger studies are required to clarify the effects of PNBs on myocardial infarction and death.

How up-to-date is this review?

This is an updated review. Evidence is up-to-date to 16 November 2019.

SUMMARY OF FINDINGS

Summary of findings 1. Peripheral nerve blocks for hip fracture

Peripheral nerve blocks for hip fracture

Patient or population: patients with hip fracture

Settings: for outcomes included in this table, studies were conducted in Argentina (N = 1), Canada (N = 1), Chile (N = 1), China (N = 4), Denmark (N = 1), France (N = 2), Germany (N = 1), Greece (N = 2), Ireland (N = 1), Japan (N = 1), Korea (N = 1), Nepal (N = 1), South Africa (N = 1), Spain (N = 2), Sweden (N = 2), Switzerland (N=1), Turkey (N = 2), United Kingdom (N = 5), and United States of America (N = 2)

Intervention: peripheral nerve blocks

Comparison: no block

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Systemic analgesia	Peripheral nerve blocks				
Pain on movement at 30 minutes after block placement Follow-up: 20 to 45 minutes		Mean pain on movement at 30 minutes after block placement in the intervention groups was 1.05 standard deviations lower (1.25 to 0.86 lower)		503 (11 studies)	⊕⊕⊕⊕ high a,b	
Acute confusional state Follow-up: 0 to 30 days	Study population		RR 0.67 (0.50 to 0.90)	1072 (13 studies)	⊕⊕⊕⊕ high a,c	
	181 per 1000	121 per 1000 (90 to 163)				
	Low					
	150 per 1000	101 per 1000 (75 to 135)				
	High					
	350 per 1000	235 per 1000 (175 to 315)				
Myocardial infarction Follow-up: 0 to 30 days	N/A		N/A	31 (1 study)	⊕⊕⊕○ low ^d	

Chest infections Follow-up: 0 to 30 days	Study population		RR 0.41 (0.19 to 0.89)	131 (3 studies)	⊕⊕⊕⊖ moderate ^{e,f}
	269 per 1000	110 per 1000 (51 to 239)			
	Low				
	50 per 1000	20 per 1000 (9 to 44)			
	High				
	200 per 1000	82 per 1000 (38 to 178)			
Death Follow-up: 0 to 6 months	Study population		RR 0.87 (0.47 to 1.60)	617 (11 studies)	⊕⊕⊖⊖ low ^d
	68 per 1000	59 per 1000 (32 to 109)			
	Low				
	25 per 1000	22 per 1000 (12 to 40)			
	High				
	150 per 1000	131 per 1000 (70 to 240)			
Time to first mobilization Follow-up: in-hospital		Mean time to first mobilization in intervention groups was 10.80 hours lower (12.83 to 8.77 lower)		208 (3 studies)	⊕⊕⊕⊖ moderate ^e
Cost of analgesic regimens for single-injection blocks Follow-up: in-hospital		Mean cost of analgesic regimens for single-injection blocks in intervention groups was 4.40 euros lower (4.84 to 3.96 lower)		75 (1 study)	⊕⊕⊕⊖ moderate ^{d,g}

The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: confidence interval; N/A: not applicable; RR: risk ratio.

GRADE Working Group grades for certainty of evidence.

High certainty: further research is very unlikely to change our confidence in the estimate of effect.

Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low certainty: we are very uncertain about the estimate.

^aThe effect was still present even when trials at high risk of bias were withdrawn from the analysis, or when a correction for the possibility of publication bias was applied.

^bThe difference was equivalent to 2.5 on a scale from 0 to 10.

^cThe number needed to treat for additional beneficial outcome was 12 (95% confidence interval 7 to 47).

^dDowngraded by two levels for imprecision.

^eDowngraded by one level for imprecision.

^fThe number needed to treat for additional beneficial outcome was 7 (95% confidence interval 5 to 72).

^gMean costs in 2009 euros.

BACKGROUND

Description of the condition

Among women 55 years of age and older in the USA, the Nationwide Inpatient Sample (NIS) for 2000 to 2010 reported 4.9 million hospitalizations for osteoporotic fractures (2.6 million for hip fractures) – a higher number of hospitalizations than for myocardial infarction (2.9 million), stroke (3.0 million), and breast cancer (0.7 million) (Singer 2015). Osteoporotic fractures accounted for more than 40% of hospitalizations for these four outcomes, with an age-adjusted rate of 1124 admissions per 100,000 person-years. The annual total population facility-related hospital cost was highest for hospitalizations due to osteoporotic fractures (USD 5.1 billion), followed by myocardial infarction (USD 4.3 billion), stroke (USD 3.0 billion), and breast cancer (USD 0.5 billion) (Singer 2015).

The term 'hip fracture' refers to a fracture of the proximal femur down to about 5 cm below the lower border of the lesser trochanter. Costs of care for hip fractures are high and, when both acute care and the care needed for subsequent dependency were included, exceeded GBP 2 billion in 2012 for the UK as a whole. That same year, the overall rate of return home by 30 days was 44.6% in the UK (National Hip Fracture Database 2019; www.nhfd.co.uk). In the USA, from 2003 to 2005, 5.3% of patients with hip fracture returned home in 30 days, and 52.8% were discharged to a skilled nursing facility (Brauer 2009). Hip fractures are associated with reduced life expectancy when they occur in individuals over 50 years of age. Pooled data from cohort studies revealed that the relative hazard (RH) for all-cause mortality during the first three months after hip fracture was 5.75 (95% confidence interval (CI) 4.94 to 6.67) in women and 7.95 (95% CI 6.13 to 10.30) in men (Haentjens 2010). However, improved care has resulted in encouraging figures. Indeed, data collected in UK in 2018 show a 6.1% death rate, representing a decrease of one in eight when compared with the mortality figure of 6.9% reported for 2017, implying that 564 fewer people died within a month of breaking their hip in 2018 (National Hip Fracture Database 2019).

Description of the intervention

Regional blockade refers to injection of local anaesthetics around neural structures to transiently prevent pain transmission to the brain, and may also produce motor blockade of the muscle in a specific area, depending on the type and concentration of local anaesthetic used. Local anaesthetics can be used at the spine level (neuraxial blocks = epidural or spinal) or around the nerves outside the spine (plexus blocks or peripheral nerve blocks (PNBs)). Local anaesthetic may also be infiltrated directly into wound tissues. All of these blocks can be given as a single injection or by continuous infusion through a catheter to prolong their beneficial effects. PNBs may be used as a replacement for general anaesthesia during surgery, as adjunctive treatment for preoperative and postoperative pain, or as a means of decreasing the use of intraoperative systemic drugs during general anaesthesia. Use of regional blockade as a replacement for general anaesthesia in individuals with hip fracture is covered in another review (Guay 2016). For the present review, the intervention is limited to PNBs used for analgesia (i.e. before surgery), in addition to other anaesthetic methods for surgery or for postoperative analgesia. Although neuraxial blocks may have been used in some trials included here (usually as replacement for general anaesthesia for

the surgery), they will not be evaluated in the present review but, once again, are covered separately in another review (Guay 2016).

How the intervention might work

Most hip fractures occur in an elderly population; more than 30% of individuals with hip fracture are 85 years of age or older (Brauer 2009). Opioid-related respiratory depression may result in severe brain damage or death (Lee 2015). By reducing the quantity of opioids used before, during, and after surgery (Guay 2006; Guay 2017), regional blockade may improve the mobility of persons with hip fracture (Saunders 2010), potentially facilitating their participation in rehabilitation and hence reducing complications related to prolonged immobilization such as pneumonia (Guay 2017). Hip fractures in the elderly have also been associated with a high rate of postoperative delirium. In a recent review on 8439 geriatric hip fracture patients, Arshi and colleagues reported a 30.4% rate of postoperative delirium (Arshi 2018). Patients with postoperative delirium had significantly higher risk-adjusted 30-day mortality (12.0% vs 4.8%; odds ratio (OR) 2.22, 95% CI 1.74 to 2.84) (Arshi 2018). Some study authors have suggested that the rate of perioperative delirium might be lower when PNBs are added to a multi-modal regimen of perioperative analgesia (Mouzopoulos 2009).

Why it is important to do this review

Despite their advantages, PNBs still are not widely used for people with hip fracture (Haslam 2013). Many official clinical societies recommend preoperative regional anaesthesia (e.g. American Academy of Orthopaedic Surgeons 2014: "strong recommendation"; NICE 2017: "consider adding nerve blocks if paracetamol and opioids do not provide sufficient preoperative pain relief, or to limit opioid dosage") and postoperative multi-modal analgesia including regional anaesthesia (e.g. American Academy of Orthopaedic Surgeons 2014: "strong recommendation") for patients with hip fracture. It is not the mandate of Cochrane reviewers to make any recommendations but rather to summarize the evidence, hence providing official societies, policy makers, clinicians, and patients with high-quality systematic reviews to help them make decisions as to what intervention should or should not be used for a specific clinical condition in their specific environment.

In addition, exclusive use of opioids for perioperative pain has become a controversial clinical practice. Between 1999 and 2016, more than 630,000 people in the United States died from a drug overdose, and a record number of drug overdose deaths occurred in 2016: 63,632 – a rate of 19.8 per 100,000 persons (Centers for Disease Control and Prevention 2018). Within the first six months of 2018 alone, 2066 opioid-related deaths were reported in Canada (11.2 deaths per 100 000 people) (Ball 2019). Up to 75% of all heroin users were first introduced to narcotics through an initial physician- or surgeon-related opioid prescription (Ball 2019). Reduction in perioperative opioid consumption with the use of regional anaesthesia has already been reported (Guay 2016; Guay 2017).

Some adverse events may happen with the use of PNBs. Severe and permanent nerve injuries have occurred, at an estimated incidence of approximately 1:2500 to 1:5000 blocks (Neal 2015). Although systemic local anaesthetic toxicity has probably decreased in both incidence and severity with the use of ultrasound, seizures are still

reported, with an incidence of 1.3 (95% CI 0.3 to 3.8) per 10,000 PNBs (Sites 2014). Finally, although infections are rarely seen with single PNBs, they may occur with catheter insertion (Bomberg 2017).

The topic of the present review is very important to update, considering: (1) the high prevalence of hip fractures, (2) the large number of official societies providing recommendations on this condition, (3) the possibility that perioperative PNBs may improve patient outcomes, and (4) the major role that PNBs may play in reducing preoperative and postoperative opioid use for analgesia.

Therefore, we have decided to re-evaluate the beneficial effects of PNBs for hip fracture.

This is an update of a previously published review (Guay 2017; Parker 2002).

OBJECTIVES

To compare PNBs used as preoperative analgesia, as postoperative analgesia, or as a supplement to general anaesthesia versus no nerve block (or sham block) for adults with hip fracture. Outcomes were pain on movement at 30 minutes after block placement, acute confusional state, myocardial infarction, chest infection, death, time to first mobilization, and costs of an analgesic regimen for single-injection blocks.

We undertook the update to look for new studies and to update the methods to reflect Cochrane standards.

METHODS

Criteria for considering studies for this review

Types of studies

We included all parallel randomized controlled trials (RCTs) and cluster trials comparing PNBs inserted preoperatively, intraoperatively, or postoperatively (intervention) versus no nerve block (or sham block) (comparator).

For the purpose of this review, a sham nerve block and no nerve block were considered as equivalent. We excluded quasi-RCTs (e.g. alternation) and cross-over trials. These two categories of trials were also excluded from previously published versions of our review. Cross-over trials were considered unsuitable for our review. Indeed, it would not be possible to evaluate the effects of adding PNBs on the risk of perioperative acute confusional state, pneumonia, myocardial infarction, or mortality if all participants had received a PNB at some point during their perioperative period (unless we had considered only the first part of the cross-over trial, when results would be available as such).

Types of participants

We included adults aged 16 years of age and older with a proximal femoral fracture (hip fracture).

Types of interventions

PNBs of any type versus no nerve block (or sham block).

Types of outcome measures

Primary outcomes

1. Pain on movement 30 minutes after block placement (study author's scale; Thong 2018)
2. Acute confusional state (study author's definition), 0 to 30 days
3. Myocardial infarction (study author's definition), 0 to 30 days

Secondary outcomes

1. Chest infection (study author's definition), 0 to 30 days
2. Mortality (all death from any cause), 0 to 6 months
3. Time to first mobilization after surgery
4. Costs of analgesic regimens (at any time points chosen by study authors)

Search methods for identification of studies

Electronic searches

We searched the Cochrane Central Register of Controlled Trials (CENTRAL; 2019, Issue 11), in the Cochrane Library; MEDLINE ALL (Ovid SP, 1966 to 16 November 2019); Embase (Ovid SP, 1974 to 16 November 2019); and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (EBSCO, 1982 to 16 November 2019). We searched for studies as described in the *Cochrane Handbook of Systematic Reviews of Interventions*, Chapter 4 (Lefebvre 2019). We combined the MEDLINE search with the Cochrane Highly Sensitive Search Strategy for identifying randomized trials in MEDLINE (Lefebvre 2019). For MEDLINE (Ovid SP), we designed a subject-specific search strategy, and we used this as the basis for search strategies used in Embase, CENTRAL, and CINAHL. When appropriate, we supplemented the search strategy with search terms used to identify RCTs. All search strategies can be found in Appendix 1. We searched the bibliographic references and citations of relevant studies and systematic reviews for further potentially relevant studies. We applied no language or publication status restrictions.

Searching other resources

We also searched <http://www.clinicaltrials.gov> (18 January 2020) and <http://apps.who.int/trialsearch/> (January 2020) to identify trials in progress. We screened the reference lists of all studies retained (during data extraction) and from other recently published systematic reviews related to the topic (December 2019). We screened conference proceedings of anaesthesiology societies for 2017, 2018, and 2019, as published in two major anaesthesiology journals: *European Journal of Anaesthesiology* (January 2020) and *Regional Anesthesia and Pain Medicine* (January 2020). In addition, we looked for abstracts on the website of the American Society of Anesthesiologists for the same years (2017 to 2019; [American Society of Anesthesiologists 2020](http://www.asa-society.org)) (18 January 2020).

Data collection and analysis

Selection of studies

We independently assessed potentially eligible trials for inclusion. We resolved disagreements by discussion.

Data extraction and management

We independently extracted data for the outcomes listed above for all new trials and resolved differences through discussion. When we

were unable to extract relevant data or information, we contacted the study authors for whom we could find an email address (N = 38; Albrecht 2014; Altermatt 2013; Antonopoulou 2006; Bang 2016; Brownbridge 2018; Cuvillon 2007; De La Tabla 2010; Diakomi 2014; Domac 2015; Fletcher 2003; Foss 2005a; Gille 2006; Godoy Monzon 2010; Graham 2008; Gürtan Bölükbaşı 2013; Jadon 2014; Jang 2018; Kullenberg 2004; Landsting 2008; Liebmann 2012; Luger 2012; Ma 2018a; Madabushi 2016; Morrison 2008; Mosaffa 2005; Mouzopoulos 2009; Murgue 2006; Nie 2015; Ranjit 2016; Segado Jimenez 2009; Szucs 2010; Thompson 2019; Tuncer 2003; Unneby 2017; Uysal 2018; Wang 2015; Yamamoto 2016; Yun 2009).

Assessment of risk of bias in included studies

We evaluated the quality of all included studies using the new Cochrane Risk of Bias-2 tool for each outcome (Summary of findings 1) (last accessed July 2020; Sterne 2019).

1. Pain on movement at 30 minutes after block placement.
2. Acute confusional state (0 to 30 days).
3. Myocardial infarction (0 to 30 days).
4. Pneumonia (0 to 30 days).
5. Death (0 to 6 months).
6. Time to first mobilization (in-hospital).
7. Cost of analgesic regimens for single-injection PNBs (in-hospital).

Risks of bias for all outcomes were independently assessed by two review authors with respect to the effect of assignment to the intervention at baseline. We first read the detailed guidance document (available at drive.google.com/file/d/19R9savfPdCHC8XLz2iiMvL_71lPJERWK/view). We completed a Word document template (available at drive.google.com/file/d/18Zks7k4kxhbUULbZ51Ya5xYa3p3ECQV0/view) for each included trial and for each outcome to allow agreement between the two review authors. We settled any disagreement by discussion. Then, one review author (JG) entered data into the Excel tool (available at drive.google.com/file/d/1KSFASeBJP8FJBMPeEbNIDiXp4CKuOZGM/view). The Word document was converted into a PDF document and stored online in an open repository (Figshare) (Guay 2020).

Briefly, we considered bias arising from the following domains: bias in the randomization process, bias due to deviations from intended interventions, bias due to missing outcome data, bias in measurement of outcomes, and bias in selection of the reported result. For each signalling question, we answered yes, probably yes, probably no, no, or no information, based on information retrieved from the reports or from the study authors. We inserted brief direct quotations into the text box to support those answers.

Subsequently, each outcome result was given an overall judgement for risk of bias.

1. Low risk of bias overall, if all domains for this result were assessed as 'low' risk.
2. Some concerns overall, if at least one domain for this result was assessed as 'some concerns' but none were assessed as 'high' risk.
3. High risk of bias overall, if at least one domain was assessed as 'high' risk, or if we had 'some concerns' about several domains that, when considered together, could indicate 'high' risk of bias.

Additional details can be found in Appendix 2.

We planned to evaluate risks of bias of cluster trials using the cluster trial extension for Risk of Bias-2 (Eldridge 2016).

When possible, we mentioned the direction of the bias.

Measures of treatment effect

We presented results as risk ratios (RRs) or risk differences (RDs), along with the 95% confidence intervals (95% CIs) for dichotomous data, and as mean differences (MDs) and 95% CIs for continuous data. Although hazard ratio would have been optimal for time to event data (time to first mobilization; Deeks 2019), data were unfortunately not available in this format. If some of the continuous data were reported using different scales, or when results were not provided as mean and standard deviation (SD) (therefore extracted as P values), we produced the results as standardized mean differences (SMDs) and 95% CIs. For SMDs, we considered 0.2 to be a small effect, 0.5 to be a moderate effect, and 0.8 to be a large effect (Pace 2011). A clinical equivalence was calculated for results produced as SMD. When results for dichotomous data showed an effect, we calculated the number needed to treat for an additional beneficial outcome (NNTB) or the number needed to treat for an additional harmful outcome (NNTH), using the odds ratio. We provided results for dichotomous data as RRs as often as was feasible, as the odds ratio (OR) is not easily understood by clinicians (Deeks 2002; McColl 1998). We used the OR for calculation of NNTB and NNTH (<http://www.nntonline.net/visualrx/>), as this value is less likely to be affected by the side (benefit or harm) on which data are entered (Cates 2002; Deeks 2002). When we noted no effect, we calculated the optimal information size to make sure that enough participants were included in the retained studies to justify a conclusion on the absence of effect (Pogue 1998; <http://www.stat.ubc.ca/~rollin/stats/ssize/b2.html>). We arbitrarily defined a difference of 25% (increase or decrease) as the minimal clinically relevant difference (Schünemann 2019).

Unit of analysis issues

If a trial included more than two groups, we fused two groups (by using the appropriate formula for adding standard deviations, when required) when we thought that they were equivalent according to the criteria chosen a priori for exploration of heterogeneity; we separated them and split the control group in half if we thought that they were different (Higgins 2019). For cluster trials, we planned to simply extract odds ratios and their confidence intervals when an appropriate analysis was used by study authors. If not, we planned to correct the sample sizes or inflate the standard errors, as recommended by Cochrane (Higgins 2019).

Dealing with missing data

We contacted study authors to ask for apparently missing data. We did not consider medians as equivalent to means. Instead, we used the P value and the number of participants included in each group to calculate the effect size. We did not use imputed results. We entered data as intention-to-treat (ITT) as much as was feasible in accordance with our choice for risk of bias assessment (i.e. "assignment to the intervention at baseline"). If this was not possible, we entered the data on a per-protocol basis and took this into account in our risk of bias assessment.

Assessment of heterogeneity

We considered clinical heterogeneity before pooling results, and we examined statistical heterogeneity. We visually examined all forest plots. We quantified statistical heterogeneity by using the I^2 statistic with data entered in the way (benefit or harm) that yielded the lowest amount. We qualified the amount as follows: might not be important (0% to 40%), may represent moderate heterogeneity (30% to 60%), may represent substantial heterogeneity (50% to 90%), or considerable heterogeneity (75% to 100%), depending on the value obtained for the I^2 statistic (Deeks 2019).

Assessment of reporting biases

We examined publication bias by using a funnel plot, then performed Duval and Tweedie's trim and fill technique for each outcome. When publication bias is present, this technique yields an adjusted point of estimate that takes into account the number of theoretically missing studies.

Data synthesis

We analysed the data using RevMan 5.3 and Comprehensive Meta-Analysis Version 2.2.044 (www.Meta-Analysis.com; visual inspection of forest plots with data placed in a specific order, Egger's regression intercept, Duval and Tweedie's trim and fill analysis, and meta-regression) with fixed-effect models. We avoided random-effects models due to a large number of small studies. Random-effects models give greater weight to small studies. We presented study characteristics in relevant tables (Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies). We presented risk of bias assessments in graphs and results for each comparison as forests plots or narratively (in the case of comparisons with fewer than two available trials or for results with a high level of heterogeneity unexplained by heterogeneity exploration).

Subgroup analysis and investigation of heterogeneity

For exploration of heterogeneity, we focused specifically on comparisons with more than a small amount of heterogeneity ($I^2 > 40\%$) (Deeks 2019). We used Egger's regression intercept to assess the possibility of a small-study effect (Rucker 2011; Sterne 2001). We visually inspected forest plots with trials placed in order according to a specific moderator. If forest plots suggested a specific moderator to be relevant, we used subgroup analysis or meta-regression with Comprehensive Meta-Analysis Version 2.2.044 (www.Meta-Analysis.com).

We explored heterogeneity by conducting subgroup analysis based on the following categories.

1. Type of nerve block (e.g. psoas compartment, fascia iliaca, femoral nerve (we considered three-in-one and triple nerve blocks as femoral nerve blocks), lateral femoral cutaneous, obturator).
2. Single-injection PNB versus continuous infusion.
3. Technique of localization (landmark, nerve stimulator, or ultrasound).
4. American Society of Anesthesiologists (ASA) physical status of participants.

We used meta-regression for ages of participants included, year the study was published, and local anaesthetic concentration

in lidocaine equivalent (used for single-injection PNBs only and calculated as follows: lidocaine = 1, bupivacaine = 4, chloroprocaine = 1.5, dibucaine = 4, etidocaine = 4, levobupivacaine = 3.9, mepivacaine = 0.8, prilocaine = 0.9, procaine = 0.5, ropivacaine = 3, and tetracaine = 4) (Berde 2009)).

Sensitivity analysis

We performed a sensitivity analysis based on risk of bias of the study, or if a study was a clear outlier, as long as a reason differentiating this study from the other studies (difference in study design, population, intervention, comparator, or outcome measurement) could be identified. For risk of bias, for each outcome, we reported the results obtained while excluding trials at high risk of bias based on overall risk of bias judgements.

Summary of findings and assessment of the certainty of the evidence

We used the principles of the GRADE approach to assess the certainty of evidence associated with all outcomes (pain on movement 30 minutes after block placement, acute confusional state, myocardial infarction, pneumonia, death, time to first mobilization, and cost of analgesic regimen for single PNBs) (Schünemann 2019), and we constructed Summary of findings 1 using GRADEPro.

For uncertainty resulting from risk of bias, we judged the certainty of evidence as presenting low risk of bias when exclusion of trials at high risk of bias did not change the conclusion. We downgraded quality by one or two levels when excluding trials at high risk of bias changed the conclusion, or when evidence was based mainly on trials with multiple domains with some concerns.

For uncertainty resulting from inconsistency, we downgraded the certainty of evidence by one level when the I^2 statistic was 50% or higher without satisfactory explanation, and by two levels when the I^2 statistic was 75% or higher without an explanation. We also considered clinical heterogeneity as a potential contributor to inconsistency.

For uncertainty resulting from indirectness and applicability, we planned to downgrade the certainty of evidence if outcomes were not measured on the population of interest, involved differences in intervention (different setting or related interventions), involved differences in outcomes measures (surrogate markers) or were based on indirect comparisons (Schünemann 2013).

For uncertainty resulting from imprecision (Zhang 2019), we downgraded the certainty of evidence by one or two levels when the CI around the effect size was large or overlapped with absence of effect and failed to exclude an important benefit or harm, or when the number of participants was smaller than the optimal information size. The outcome itself was also taken into account.

For uncertainty resulting from publication bias, we downgraded the certainty of evidence by one level when correcting for the possibility of publication bias as assessed by Duval and Tweedie's fill and trim analysis changed the conclusion.

RESULTS

Description of studies

Characteristics of included studies, excluded studies, and ongoing trials can be found in [Characteristics of included studies](#), [Characteristics of excluded studies](#), and [Characteristics of ongoing studies](#) tables, respectively.

Results of the search

Details of the search for this update can be found in [Figure 1](#). We found 477 titles from the Cochrane Central Register of

Controlled Trials (CENTRAL), 211 from the Cumulative Index to Nursing and Allied Health Literature (CINHAL), 410 from Embase, and 418 from MEDLINE. Upon adding articles from the latest previously published version, titles from references lists of articles retained and from relevant reviews, conference proceedings, and ongoing trials, we retrieved 158 articles. We excluded 46 trials due to ineligible study design, 20 because they studied a different population, 40 because they studied a different intervention, and five because they were withdrawn or were terminated by study authors. Twenty-nine trials were ongoing.

Figure 1. Flow diagram for the 2020 update. CENTRAL: The Cochrane Central Register of Controlled Trials; CINHAL: Cumulative Index to Nursing and Allied Health Literature.

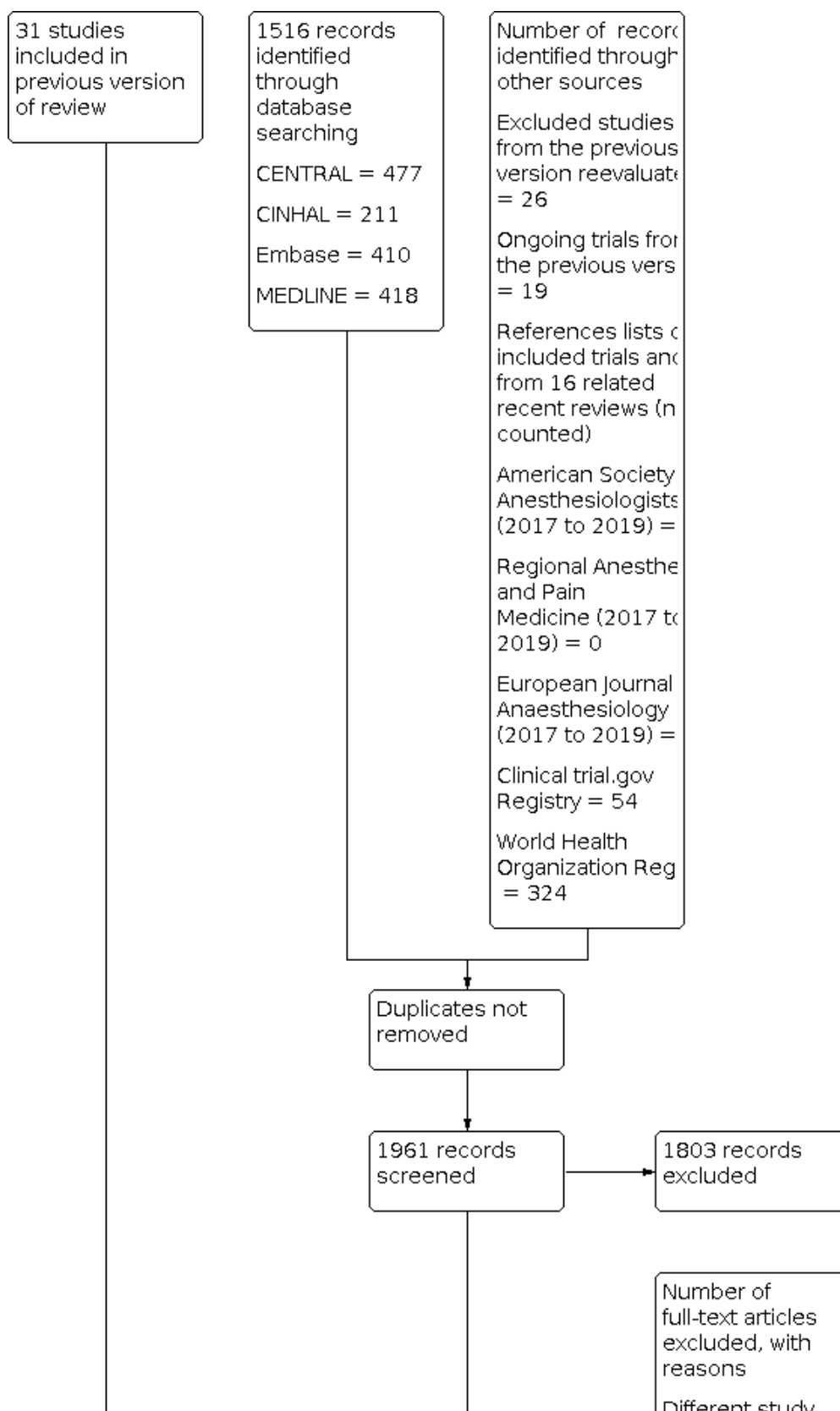
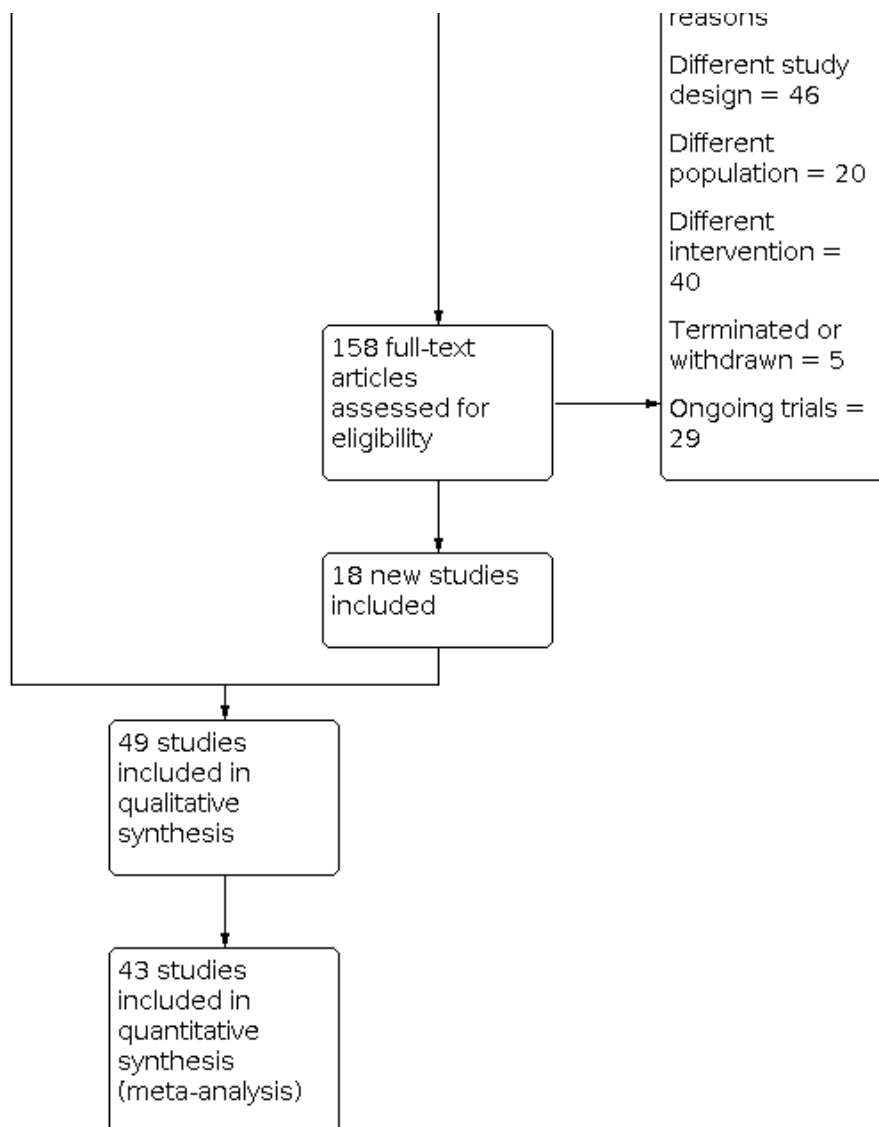


Figure 1. (Continued)



Included studies

We included 49 trials with 3061 participants; 1553 participants were randomized to PNBs and 1508 to no nerve block (or sham block). Forty-three trials with 2750 participants could be included in the analysis: 1368 participants randomized to PNBs and 1382 randomized to no nerve block (or sham block).

Trials were published between 1980 and 2020 and were funded by a charitable organization (N = 5; [Cuvillon 2007](#); [Foss 2005a](#); [Liebmann 2012](#); [Ma 2018a](#); [Unneby 2017](#)), by a governmental organization (N = 5; [Altermatt 2013](#); [Jang 2018](#); [Landsting 2008](#); [Morrison 2008](#); [Nie 2015](#)), or by departmental/institutional resources (N = 16; [Albrecht 2014](#); [Bang 2016](#); [Brownbridge 2018](#); [Domac 2015](#); [Gille 2006](#); [Henderson 2008](#); [Godoy Monzon 2010](#); [Jadon 2014](#); [Luger 2012](#); [Madabushi 2016](#); [Szucs 2010](#); [Thompson 2019](#); [Uysal 2018](#); [Wang 2015](#); [Yamamoto 2016](#); [Yun 2009](#)). Remaining trials did not specify the source of funding.

Some trials were registered at an official trial registry outside the institution (N = 13; [Albrecht 2014](#); [Altermatt 2013](#); [Bang 2016](#); [Brownbridge 2018](#); [Diakomi 2014](#); [Foss 2005a](#); [Hogg 2009](#); [Jang 2018](#); [Landsting 2008](#); [Liebmann 2012](#); [Morrison 2008](#); [Wang 2015](#); [Yamamoto 2016](#)).

Trials were performed in Argentina (N = 1; [Godoy Monzon 2010](#)), Austria (N = 1; [Luger 2012](#)), Canada (N = 1; [Brownbridge 2018](#)), Chile (N = 1; [Altermatt 2013](#)), China (N = 5; [Graham 2008](#); [Nie 2015](#); [Ma 2018a](#); [Wang 2015](#); [Yang 2016](#)), Denmark (N = 2; [Foss 2005a](#); [Spansberg 1996](#)), France (N = 2; [Cuvillon 2007](#); [Murgue 2006](#)), Greece (N = 3; [Antonopoulou 2006](#); [Diakomi 2014](#); [Mouzopoulos 2009](#)), Germany (N = 1; [Gille 2006](#)), India (N = 2; [Jadon 2014](#); [Madabushi 2016](#)), Iran (N = 1; [Mosaffa 2005](#)), Ireland (N = 1; [Szucs 2010](#)), Israel (N = 1; [Chudinov 1999](#)), Japan (N = 1; [Yamamoto 2016](#)), Korea (N = 3; [Bang 2016](#); [Jang 2018](#); [Yun 2009](#)), Nepal (N = 1; [Ranjit 2016](#)), South Africa (N = 1; [White 1980](#)), Spain (N = 2; [De La Tabla 2010](#); [Segado Jimenez 2009](#)), Sweden (N = 3; [Kullenberg 2004](#); [Landsting 2008](#); [Unneby 2017](#)), Switzerland (N = 1; [Albrecht 2014](#)), Turkey (N = 1; [Albrecht 2014](#)).

= 5; Deniz 2014; Domac 2015; Gürtan Bölükbaşı 2013; Tuncer 2003; Uysal 2018), United Kingdom (N = 6; Coad 1991; Fletcher 2003; Haddad 1995; Hogg 2009; Hood 1991; Jones 1985), and United States of America (N = 4; Henderson 2008; Liebmann 2012; Morrison 2008; Thompson 2019).

The average age of participants ranged from 59 to 89 years. Participants included had an American Society of Anesthesiologists (ASA) physical status between I and IV. The proportion of included females varied between 33% and 95%. The proportion of arthroplasty varied between 0 and 100%.

Details of the PNBs, anaesthetic techniques, comparators, and rescue analgesics used are included in Table 1.

PNBs performed included a femoral nerve block (femoral or three-in-one block or triple nerve block) (N = 22; Antonopoulou 2006; Coad 1991; Cuvillon 2007; De La Tabla 2010; Deniz 2014; Fletcher 2003; Gille 2006; Graham 2008; Haddad 1995; Henderson 2008; Jadon 2014; Jang 2018; Kullenberg 2004; Liebmann 2012; Luger 2012; Murgue 2006; Ranjit 2016; Spansberg 1996; Szucs 2010; Tuncer 2003; Unneby 2017; Uysal 2018), a femoral nerve block plus an infiltration above the iliac crest (N = 1; Hood 1991), a femoral nerve block followed by a fascia iliaca block (N = 1; Morrison 2008), a fascia iliaca compartment block (N = 21; Albrecht 2014; Bang 2016; Brownbridge 2018; Deniz 2014; Diakomi 2014; Domac 2015; Foss 2005a; Godoy Monzon 2010; Gürtan Bölükbaşı 2013; Hogg 2009; Landsting 2008; Ma 2018a; Madabushi 2016; Mosaffa 2005; Mouzopoulos 2009; Nie 2015; Thompson 2019; Wang 2015; Yamamoto 2016; Yang 2016; Yun 2009), a lateral femoral cutaneous nerve block (N = 2; Coad 1991; Jones 1985), a lateral femoral cutaneous nerve block plus an obturator nerve block (N = 1; Segado Jimenez 2009), an obturator nerve block (N = 1; Segado Jimenez 2009), or a psoas compartment block (N = 3; Altermatt 2013; Chudinov 1999; White 1980).

Techniques of localization used for PNBs included loss of resistance to air (N = 1; Chudinov 1999), use of nerve stimulator (N = 14; Altermatt 2013; Antonopoulou 2006; Cuvillon 2007; Gille 2006; Graham 2008; Henderson 2008; Hood 1991; Jadon 2014; Kullenberg 2004; Murgue 2006; Spansberg 1996; Szucs 2010; Tuncer 2003; Unneby 2017), paraesthesia (N = 2; Fletcher 2003; Haddad 1995), ultrasound with or without a nerve stimulator (N = 15; Bang 2016; De La Tabla 2010; Deniz 2014; Gürtan Bölükbaşı 2013; Jang 2018; Liebmann 2012; Luger 2012; Ma 2018a; Morrison 2008; Ranjit 2016; Thompson 2019; Uysal 2018; Wang 2015; Yamamoto 2016; Yang 2016), or landmarks (N = 15; Albrecht 2014; Brownbridge 2018; Coad 1991; Diakomi 2014; Domac 2015; Foss 2005a; Godoy Monzon 2010; Jones 1985; Landsting 2008; Madabushi 2016; Mouzopoulos 2009; Nie 2015; Segado Jimenez 2009; White 1980; Yun 2009). Hogg 2009 and Mosaffa 2005 provided no information on the localizing technique.

PNBs were single-injection PNBs or continuous PNBs (infusion or repeated doses) (N = 17; Altermatt 2013; Antonopoulou 2006; Brownbridge 2018; Chudinov 1999; Cuvillon 2007; De La Tabla 2010; Gille 2006; Luger 2012; Ma 2018a; Morrison 2008; Mouzopoulos 2009; Nie 2015; Spansberg 1996; Szucs 2010; Tuncer 2003; Wang 2015; Yang 2016) given for a duration ranging from 15 to 72 hours.

Investigators performed PNBs for preoperative analgesia (N = 14; Albrecht 2014; Fletcher 2003; Foss 2005a; Godoy Monzon 2010; Graham 2008; Haddad 1995; Henderson 2008; Jang 2018;

Kullenberg 2004; Landsting 2008; Liebmann 2012; Ma 2018a; Murgue 2006; Uysal 2018); for preoperative, intraoperative, and postoperative analgesia (N = 10; Altermatt 2013; Brownbridge 2018; Chudinov 1999; De La Tabla 2010; Gille 2006; Luger 2012; Morrison 2008; Szucs 2010; Unneby 2017; Wang 2015); for spinal positioning and intraoperative and postoperative analgesia (N = 10; Diakomi 2014; Domac 2015; Gürtan Bölükbaşı 2013; Hogg 2009; Jadon 2014; Madabushi 2016; Mosaffa 2005; Ranjit 2016; Yamamoto 2016; Yun 2009); for preoperative and postoperative analgesia (N = 1; Mouzopoulos 2009); for intraoperative and postoperative analgesia (N = 5; Deniz 2014; Hood 1991; Thompson 2019; White 1980; Yang 2016); or for postoperative analgesia (N = 9; Antonopoulou 2006; Bang 2016; Coad 1991; Cuvillon 2007; Jones 1985; Nie 2015; Segado Jimenez 2009; Spansberg 1996; Tuncer 2003). Exact time of block placement can be found in Table 1.

Excluded studies

We excluded 46 studies based on study design (Akhtar 2015; Arsoy 2017; Arsoy 2017a; Barnes 2019; Beaudoin 2010; Bendtsen 2015b; Callear 2016; Candal-Couto 2005; Castillon 2017; Chang 2011; Christos 2010; Dulaney-Cripe 2012; Elkhodair 2011; Evans 2019; Finlayson 1988; Foss 2009; Fujihara 2013; Godoy Monzon 2007; Gosavi 2001; Gozlan 2005; Grigg 2009; Groot 2015; Haines 2012; Hauritz 2009; Helsø 2016; Hogg 2008; Irwin 2012; Isalgue 2014; Ishioka 2018; Kassam 2018; Klukowski 2017; Kumar 2016; Kumie 2015; Leeper 2012; Levente 2017; Lopez 2003; McGlone 1987; Perrier 2010; Randall 2008; Rapchuk 2013; Rojas Rivera 2002; Tao 2016; Thakur 2018; Vats 2016; Wang 2019; Williams 2016); 20 trials because they studied a different population (Anaraki 2012; Bhadani 2017; Bulger 2015; Carlisle 2004; Durrani 2013; Iamaroon 2010; Kacha 2018; Levine 2003; Li 2013; Masoumi 2014; McRae 2015; Mmary 2015; Mostafa 2015; Mutty 2007; Pakhare 2016; Reddy 2016; Segado Jimenez 2010; Shi 2018; Sia 2004; Singh 2016); and 40 trials because they studied a different intervention (Amini 2012; Amiri 2012; Aprato 2018; Bech 2011; Bendtsen 2015a; Bhattacharya 2019; Bouhours 2010; Dodd 2019; Foss 2005; Gasanova 2019; George 2016; Ghimire 2015; Gorodetskyi 2007; Hao 2018; Hoffmann 2015; Hussain 2014; Inan 2009; Kang 2013; Kristek 2019; Lee 2015; Lee 2016; Li 2013; Mannion 2005; Manohara 2015; Marhofer 1998; Matot 2003; Nielsen 2015; Parras 2016; Piangatelli 2004; Rashwan 2013; Reavley 2015; Sahota 2011; Scheinin 2000; Sonawane 2019; Swart 2017; Turker 2003; Van Leeuwen 2000; Wei 2018; Zadeh 2015; Zheng 2017). Five trials were either terminated or withdrawn by study authors (Bendtsen 2014; Bendtsen 2015; Hallberg 2012; Siguira 2014; WHO Int 2007). Details on reasons for exclusion can be found in Characteristics of excluded studies tables.

Studies awaiting classification

We have no studies awaiting classification.

Ongoing studies

We found 29 ongoing trials (Capelleri 2017; Carvalho 2015; Chinachoti 2010; Chiu 2016; ClinicalTrials.gov 2019; Compere 2012; Cong 2016; Dhimar 2017; Diakomi 2015; El Sharkawy 2016; Kulkarni 2018; Levins 2006; Li 2018; Luo 2019; Mathijssen 2015; Nguyen 2018; Park 2009; Postma 2017; Qiu 2018; Ridderikhof 2015; Saga 2019; Sahiti 2019; Shah 2016; Tsui 2015; Winso 2009; Xi 2014; Xuesheng 2019; Yuan 2017; Yun 2018). Details on ongoing trials can be found under Characteristics of ongoing studies. Fifteen trials were first posted (N = 10; ClinicalTrials.gov 2019; Kulkarni 2018; Li 2018; Luo 2019; Nguyen 2018; Qiu 2018; Saga 2019; Sahiti 2019; Xuesheng

2019; Yun 2018), or they were at least last updated (N = 5; Capelleri 2017; Dhimar 2017; Diakomi 2015; Postma 2017; Ridderikhof 2015), after 1 January 2018.

Risk of bias in included studies

A summary of the risks of bias of studies included in each analysis can be found in forest plots of each outcome (Analysis 1.1; Analysis 1.2; Analysis 1.3; Analysis 1.4; Analysis 1.5; Analysis 1.6; Analysis 1.7). Risk of bias assessments for each outcome, including all domain judgements and support for judgement, is located in the Risk of bias section (located after the [Characteristics of included studies](#)). Additional details on how the Risk of Bias-2 tool was applied for each trial for each outcome can be found in the supplemental data file available in Figshare (Guay 2020).

Briefly, the number of results at high risk of bias was low. Reasons to judge risk of bias as high were: possible problems with randomization (one trial), missing data and inability to determine whether or not missingness was related to the outcome (one trial for pain on movement at 30 minutes after block placement and one trial for acute confusional state), deviation from pre-planned analysis (one trial for pain on movement at 30 minutes after block placement), and possible unplanned outcome at the specific time point measured (one trial for mortality). Details on the implications of assessments of risk of bias for each specific result are reported in the [Effects of interventions](#) section.

Effects of interventions

See: [Summary of findings 1 Peripheral nerve blocks for hip fracture](#)

Primary outcomes

1. Pain

1.1 Pain on movement and at rest within 30 minutes after block placement

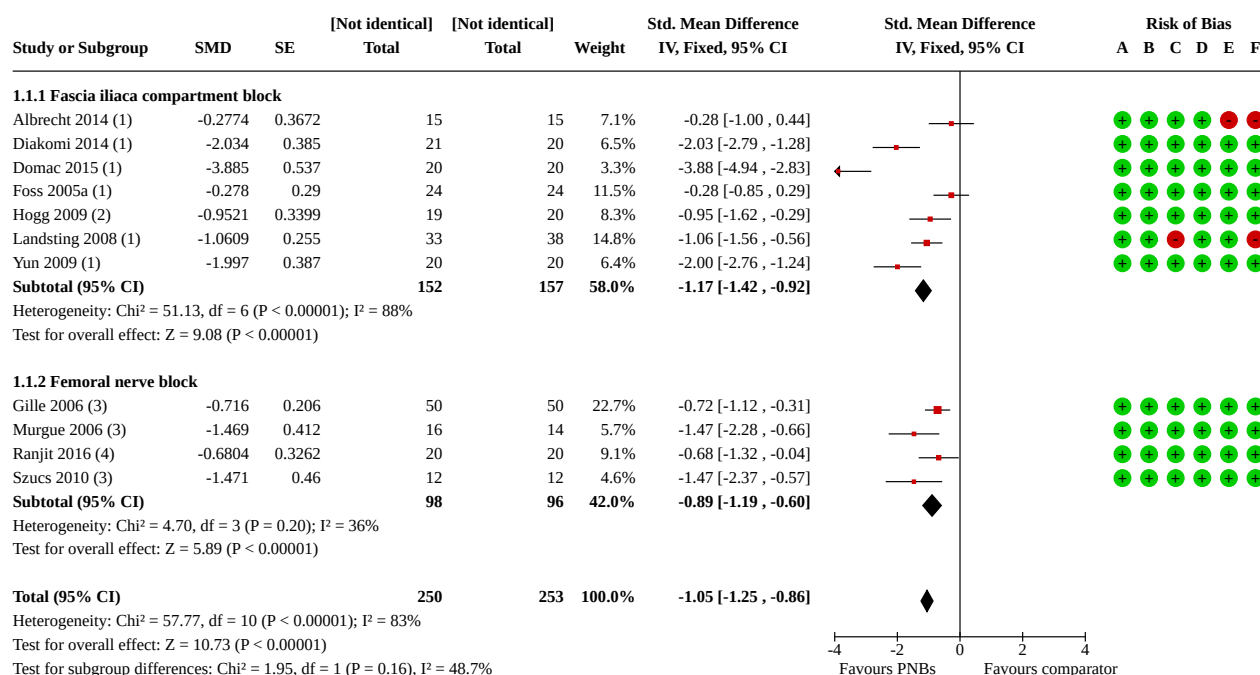
Pain on movement at 30 minutes after block placement

We did not retain data from three studies for this analysis due to inappropriate timing of outcome measurement. Jadon 2014

evaluated pain scores during positioning for spinal anaesthesia five minutes after a femoral nerve block performed with a nerve stimulator and 20 mL of a solution containing 15 mL of lidocaine 2% and 5 mL of distilled water. Parkinson 1989 reported that at five minutes after a femoral nerve block with lidocaine-HCl and a nerve stimulator, only 6 and 11 participants out of 20 would have a complete or partial femoral nerve block, and 15 minutes would be required for a complete or partial femoral nerve block in all participants. Mosaffa 2005 evaluated pain scores during positioning for spinal anaesthesia five minutes after a fascia iliaca block with 20 mL of lidocaine 1.5%. Although some effects on pain scores can be seen at 10 minutes after a fascia iliaca block with lidocaine, maximal effects are more likely to occur at 30 minutes or later (Dochez 2014; Gozlan 2005). For Brownbridge 2018, the exact time point was unclear.

We retained 11 trials that included 503 participants and evaluated pain on movement within 30 minutes after block placement (Albrecht 2014; Diakomi 2014; Domac 2015; Foss 2005a; Gille 2006; Hogg 2009; Landsting 2008; Murgue 2006; Ranjit 2016; Szucs 2010; Yun 2009). The specific intervention was a femoral nerve block - Gille 2006; Murgue 2006; Ranjit 2016; Szucs 2010 - or a fascia iliaca block - Albrecht 2014; Diakomi 2014; Domac 2015; Foss 2005a; Hogg 2009; Landsting 2008; Yun 2009. Pain scores were lower with PNBs (standardized mean difference (SMD) -1.05, 95% CI -1.25 to -0.86; $I^2 = 83\%$; Analysis 1.1; Figure 2). There was no statistical difference between a femoral nerve block versus a fascia iliaca block (P value for difference between subgroups 0.16). On the basis of a typical standard deviation in the control group of one study (2.4 (Diakomi 2014)), this was equivalent to -2.5 on a scale from 0 to 10.

Figure 2.



Footnotes

- (1) Landmarks (anatomical landmark i.e. in relation to a bony prominence or a pulsatile blood vessel)
- (2) No information on the localizing technique
- (3) Nerve stimulator
- (4) Dual technique: ultrasound guided (in-plane) plus nerve stimulator

Risk of bias legend

- (A) Bias arising from the randomization process
- (B) Bias due to deviations from intended interventions: Pain on movement within 30 minutes of block placement
- (C) Bias due to missing outcome data: Pain on movement within 30 minutes of block placement
- (D) Bias in measurement of the outcome: Pain on movement within 30 minutes of block placement
- (E) Bias in selection of the reported result: Pain on movement within 30 minutes of block placement
- (F) Overall bias: Pain on movement within 30 minutes of block placement

We identified possible significant risk of bias for two trials for this outcome (Figure 2). Landsting 2008 was judged as at high risk of bias for bias due to missing outcome data, as results for this outcome were available for 33 out of 66 participants randomized to the intervention group and for 38 out of 61 participants randomized to the comparator group. No information was provided on possible differences between participants with and without missing values. We had no information to help us determine whether or not missingness in the outcome could depend on its true value. Albrecht 2014 was judged as at high risk of bias in selection of the reported result due to the fact that study authors elected to deviate from the original planned analysis when they realized that the two groups had different mean baseline scores.

When the two trials at high risk of bias for this outcome were excluded (Albrecht 2014; Landsting 2008), SMD was -1.12 (95% CI -1.34 to -0.90). Egger's regression intercept showed the possibility of a small-study effect as a source of heterogeneity ($P = 0.03$; 2-tailed). Duval and Tweedie's trim and fill analysis showed the possibility of publication bias. Correcting for the possibility of publication bias would give an SMD of -0.88 (95% CI -1.07 to -0.70; Figure 3). Excluding trials at high risk of bias and one study that did not provide the exact concentration of local anaesthetic injected

- Murgue 2006 - led to an effect size that was correlated with the concentration of local anaesthetic used in lidocaine equivalent ($P = 0.0003$; Figure 4). We calculated equivalences as mentioned in the methods section (i.e. lidocaine = 1, bupivacaine = 4, chloroprocaine = 1.5, dibucaine = 4, etidocaine = 4, levobupivacaine = 3.9, mepivacaine = 0.8, prilocaine = 0.9, procaine = 0.5, ropivacaine = 3, and tetracaine = 4) (Berde 2009). Therefore, for Diakomi 2014, the concentration in lidocaine equivalent was calculated as 15 mg/mL (ropivacaine 0.5% or ropivacaine 5 mg/mL multiplied by 3 = 15 mg/mL). For Domac 2015, the concentration in lidocaine equivalent was calculated as 20 mg/mL (mixture of 15 mL bupivacaine 0.5% or bupivacaine 5 mg/mL multiplied by 4 = 20 mg/mL and 2% lidocaine or lidocaine 20 mg/mL). For Foss 2005a, the equivalence was calculated as 8 mg/mL (mepivacaine 1% or mepivacaine 10 mg/mL multiplied 0.8 = 8 mg/mL). For Gille 2006, the lidocaine equivalent was calculated as 9 mg/mL (1% prilocaine or prilocaine 10 mg/mL multiplied by 0.9 = 9 mg/mL). For Hogg 2009, the solution injected was lidocaine 1% (or 10 mg/mL). For Ranjit 2016, the solution injected was lidocaine 2% (or 20 mg/mL). For Szucs 2010, the equivalence was calculated as 20 mg/mL (10 mL of 2% lidocaine or lidocaine 20 mg/mL and 10 mL of 0.5% bupivacaine or bupivacaine 5 mg/mL multiplied by 4 = 20 mg/mL). For Yun 2009, the equivalence was calculated as 11.25 mg/mL (ropivacaine

0.375% or ropivacaine 3.75 mg/mL multiplied by 3 = 11.25 mg/mL). Results from [Diakomi 2014](#) (mean and SD of the control group 7.5 and 2.4) show that 182 participants (91 per group) would be

required in a simple trial to eliminate a difference of 1 on a 0 to 10 scale (alpha 0.05; beta 0.2; two-sided test) (<http://stat.ubc.ca/~rollin/stats/ssize/n2a.html>).

Figure 3. Pain on movement at 30 minutes after block placement. Duval and Tweedie's trim and fill analysis: blue circles indicate studies found, and red circles are imputed studies. Correcting for the possibility of publication bias would give an estimated standardized mean difference of -0.88 (95% confidence interval -1.07 to -0.70).

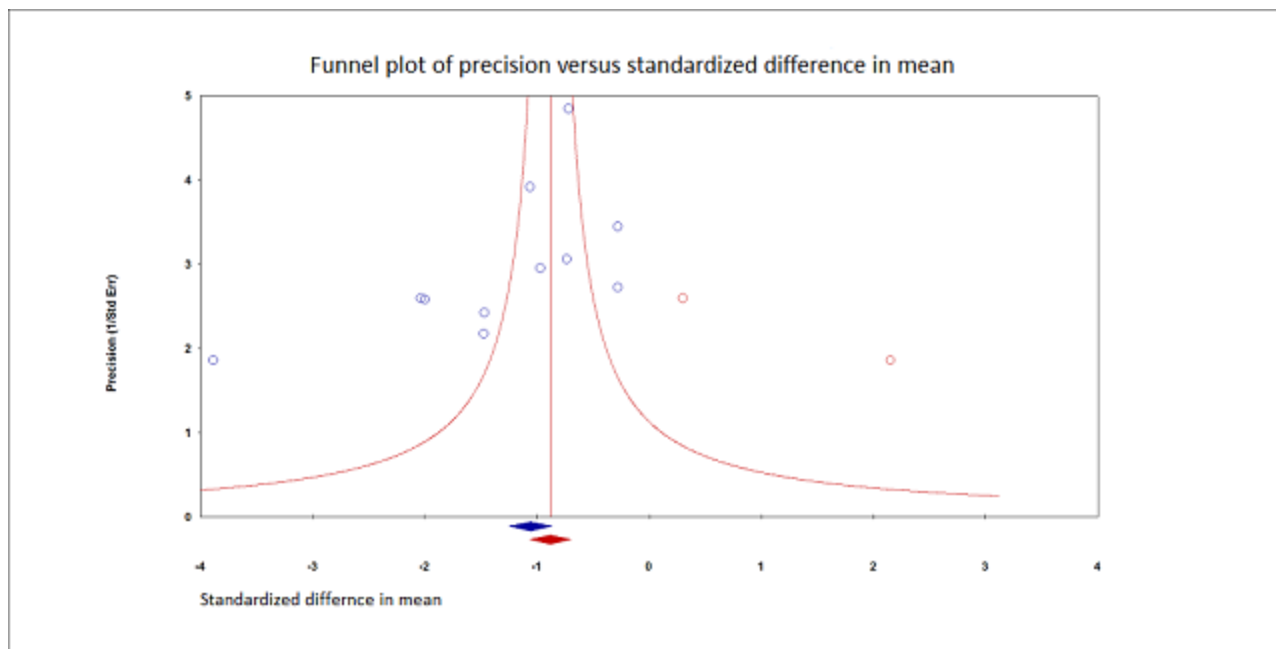
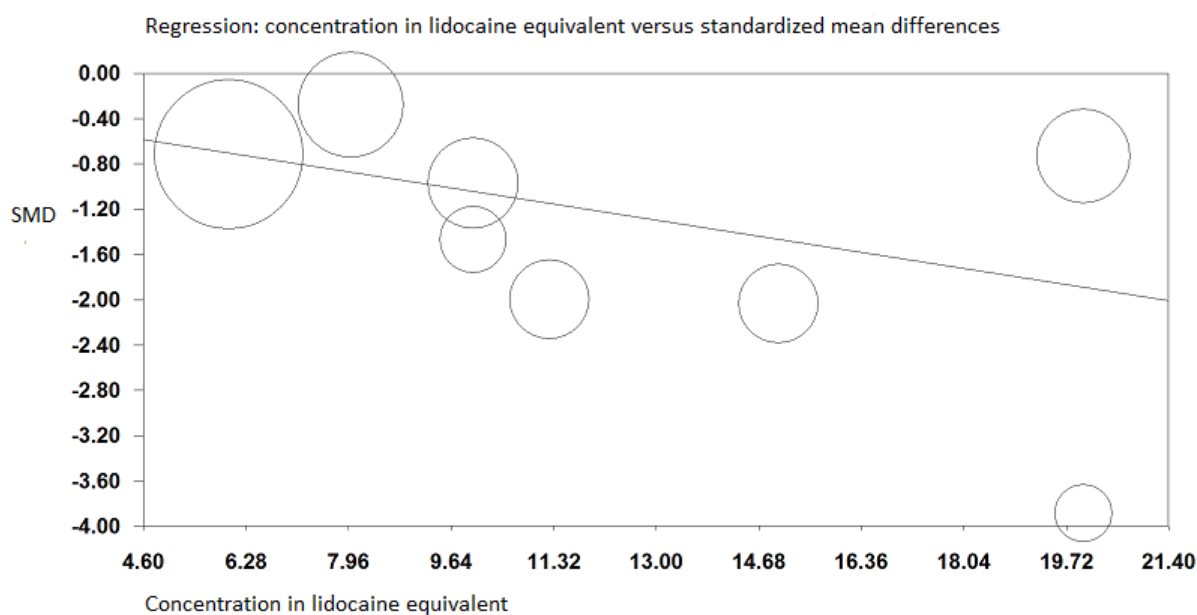


Figure 4. Pain on movement at 30 minutes after block placement. A meta-regression indicates that the effect size was proportional to the concentration of local anaesthetic injected in lidocaine equivalents; $P = 0.0003$.

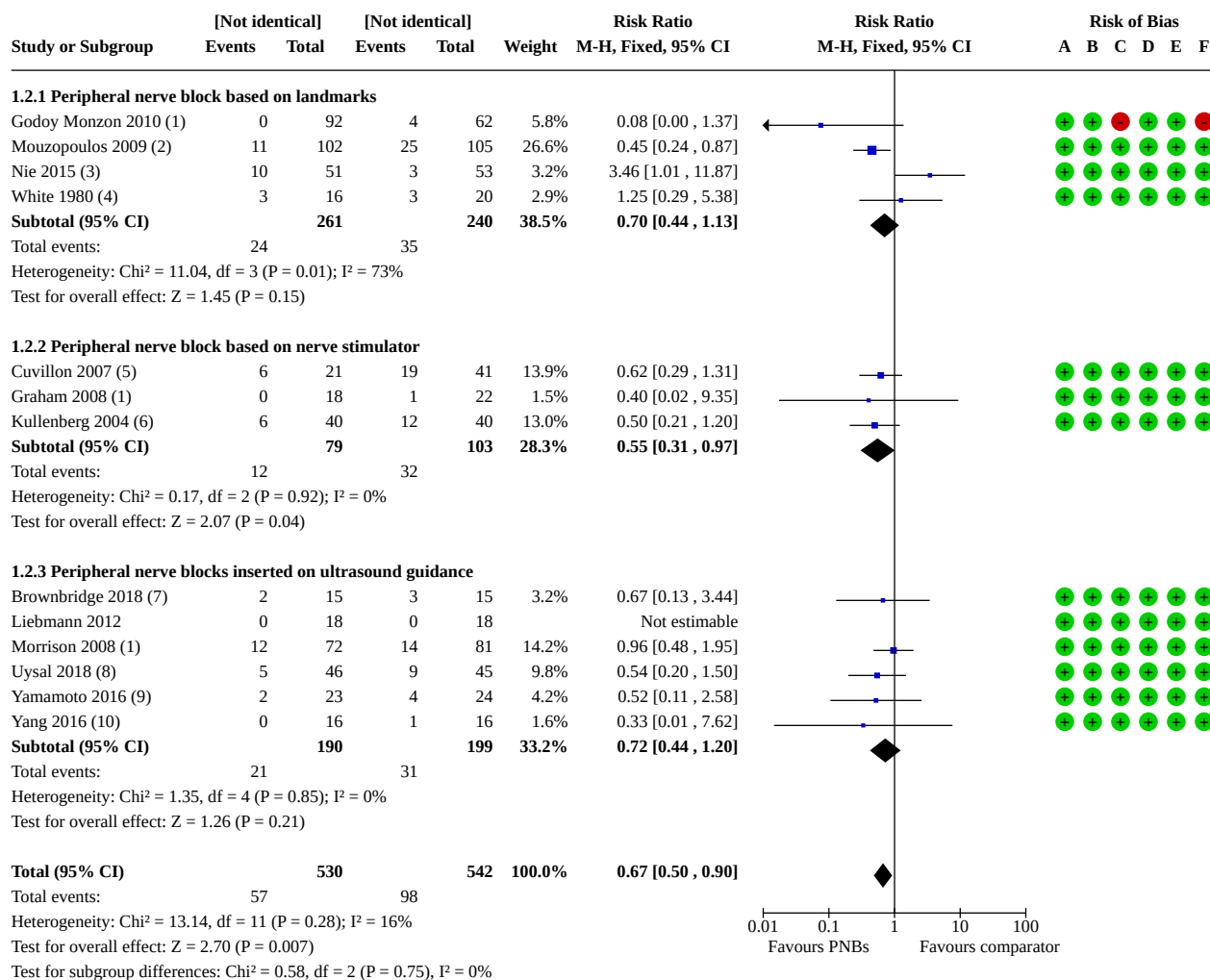


Level of certainty for pain on movement at 30 minutes after block placement

We did not downgrade for risk of bias because the effect was still present when trials at high risk of bias were excluded from the analysis. We did not downgrade the level of certainty on the basis of inconsistency because we found a reasonable explanation for heterogeneity. We used direct comparisons only with studies performed on the population of interest, and this is not a surrogate marker. The optimal information size was achieved. We did not downgrade for publication bias because the effect was still present after correction for this possibility. We rated the level of certainty as high.

2. Acute confusional state

We have provided in [Appendix 3](#) definitions for acute confusional state used by study authors. Based on 13 trials with 1072 participants ([Brownbridge 2018](#); [Cuvillon 2007](#); [Godoy Monzon 2010](#); [Graham 2008](#); [Kullenberg 2004](#); [Liebmann 2012](#); [Morrison 2008](#); [Mouzopoulos 2009](#); [Nie 2015](#); [Uysal 2018](#); [White 1980](#); [Yamamoto 2016](#); [Yang 2016](#)), the risk of acute confusional state was reduced by the use of PNBs (RR 0.67, 95% CI 0.50 to 0.90; $I^2 = 16\%$; [Analysis 1.2](#); [Figure 5](#)). There was no statistical difference according to the type of localizing technique used (landmark versus nerve stimulation versus ultrasound guidance; P value for difference between subgroups 0.75).

Figure 5. Forest plot of comparison: 1 Nerve block versus other modes of analgesia, outcome: 1.11 Acute confusional state.**Footnotes**

- (1) Blocks performed in the emergency department
- (2) Blocks started upon admission
- (3) Blocks performed after surgery only and operated 7.7 days after admission
- (4) Blocks performed intraoperatively and operated 3.5 days after admission
- (5) Catheters inserted after surgery and operated < 48 after admission
- (6) Blocks were performed immediately after X-Ray confirmation
- (7) Started shortly after admission
- (8) Repeated doses from admission to surgery for the intervention group, followed by epidural analgesia for both groups
- (9) Blocks performed in the operating room immediately before spinal block
- (10) Blocks performed immediately before anaesthesia induction

Risk of bias legend

- (A) Bias arising from the randomization process
- (B) Bias due to deviations from intended interventions: Acute confusional state
- (C) Bias due to missing outcome data: Acute confusional state
- (D) Bias in measurement of the outcome: Acute confusional state
- (E) Bias in selection of the reported result: Acute confusional state
- (F) Overall bias: Acute confusional state

Godoy Monzon 2010 was judged as at high risk of bias for this outcome due to a large quantity of missing data in the comparator group yielding two very unequal groups (i.e. 92 for the intervention

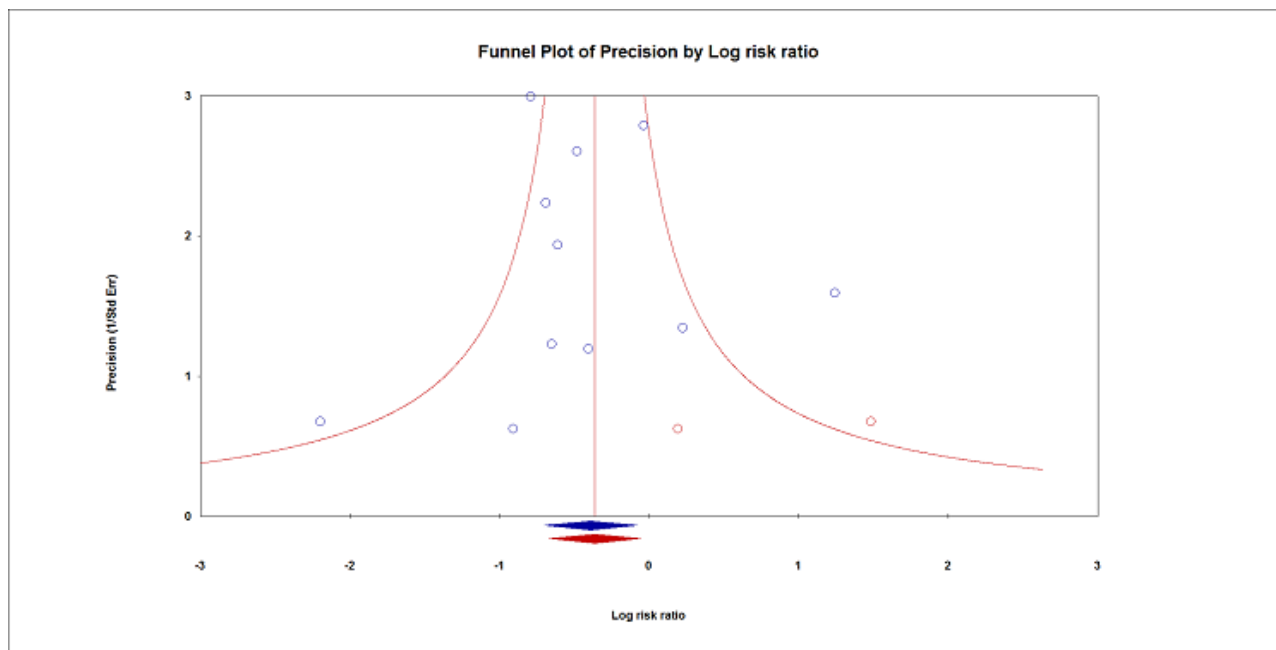
group and 62 for the comparator group). We had no information to help us determine whether or not missingness in the outcome

could depend on its true value. Excluding [Godoy Monzon 2010](#), the estimate would be RR 0.70 (95% CI 0.52 to 0.95; $I^2 = 9\%$).

Egger's regression intercept showed no evidence of small-study effect. Duval and Tweedie's trim and fill analysis calculated that two

trials might be missing to right of mean for an adjusted point of estimate of RR 0.70 (95% CI 0.51 to 0.94; [Figure 6](#)). Given a rate of 30% ([Arshi 2018](#)), the number of participants required in a large trial to eliminate a 25% decrease would be 850 (425 per group) (alpha 0.05; beta 0.2; one-sided test). The NNTB was 12 (95% CI 7 to 47).

Figure 6. Acute confusional state. Duval and Tweedie's trim and fill analysis: blue circles indicate studies found, and red circles are imputed studies. Correcting for the possibility of publication bias would give an estimated risk ratio 0.70 (95% CI 0.51 to 0.94).



Level of certainty for acute confusional state

We did not downgrade the level of certainty for risk of bias because the effect was still present when we excluded the trial at high risk of bias. We did not downgrade for heterogeneity ($I^2 < 25\%$). We included only direct comparisons performed on the population of interest, and this is not a surrogate marker. We did not downgrade for imprecision because the optimal information size was achieved. We did not downgrade the level of certainty on the basis of the possibility of publication bias because applying a correction for the possibility of one would not modify the conclusion. We rated the level of certainty of evidence as high.

3. Myocardial infarction

Only one small trial with 31 participants reported data suitable for extraction for myocardial infarction ([Altermatt 2013](#)). There were no

events ([Analysis 1.3](#)). The definition used can be found in [Appendix 4](#).

[Altermatt 2013](#) was judged as at low risk of bias for this outcome.

Level of certainty for myocardial infarction

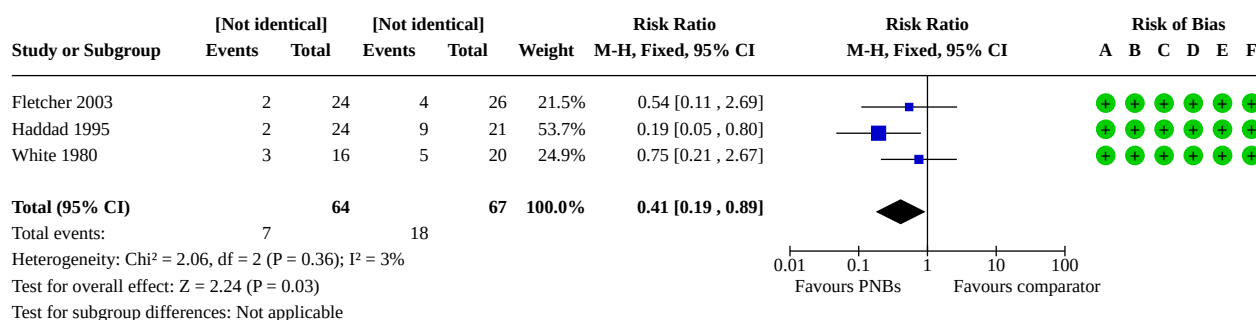
The trial was not at high risk of bias. We downgraded the level by two for imprecision and rated the level of certainty as low.

Secondary outcomes

1. Chest infection

Results of three trials with 131 participants show that PNBs reduced the risk of chest infection (RR 0.41, 95% CI 0.19 to 0.89; $I^2 = 3\%$; [Analysis 1.4](#); [Figure 7](#)) ([Fletcher 2003](#); [Haddad 1995](#); [White 1980](#)). Definitions used by study authors are provided in [Appendix 5](#).

Figure 7.



Risk of bias legend

- (A) Bias arising from the randomization process
- (B) Bias due to deviations from intended interventions: Pneumonia
- (C) Bias due to missing outcome data: Pneumonia
- (D) Bias in measurement of the outcome: Pneumonia
- (E) Bias in selection of the reported result: Pneumonia
- (F) Overall bias: Pneumonia

The three trials were judged as at low risk of bias for this outcome. Egger's regression intercept showed no significant evidence of a small-study effect. Duval and Tweedie's trim and fill analysis revealed no evidence of publication bias. Given a basal rate of 27%, the NNTB would be 7 (95% CI 5 to 72) and the number of participants required to eliminate a 25% decrease in a large trial would be 978 (489 per group) (alpha 0.05; beta 0.2; one-sided test).

Level of certainty for chest infection

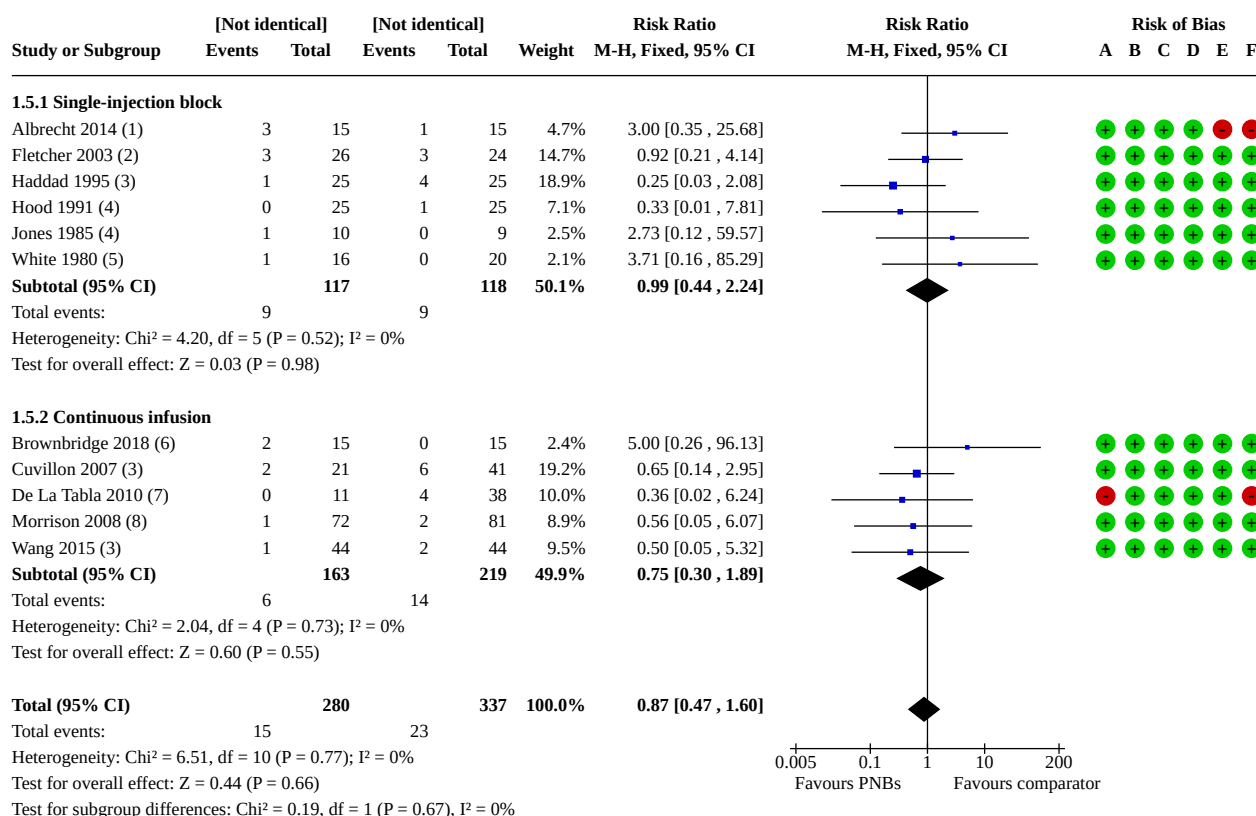
We did not downgrade for risk of bias because no trial was judged as at high risk of bias. Statistical heterogeneity was less than 25% (I² = 3%). We used direct comparisons only with studies performed on the population of interest, and this is not a surrogate marker. The

optimal information size was not achieved, so we downgraded by one level for imprecision. We found no evidence of publication bias. We rated the level of certainty as moderate.

2. Mortality

Based on 11 trials including 617 participants (Albrecht 2014; Brownbridge 2018; Cuvillon 2007; De La Tabla 2010; Fletcher 2003; Haddad 1995; Hood 1991; Jones 1985; Morrison 2008; Wang 2015; White 1980), we did not find a difference in short-term (within six months) mortality (RR 0.87, 95% CI 0.47 to 1.60; I² = 0%; Analysis 1.5; Figure 8). There was no statistical difference according to the type of block (i.e. single injection versus continuous infusion) (P value for the difference between subgroups 0.67).

Figure 8.



Footnotes

- (1) Mortality at 3 months
- (2) Mortality at 6 months
- (3) Mortality in hospital
- (4) Mortality at 24 hours
- (5) Mortality at 28 days
- (6) Mortality at 30 days
- (7) Mortality at 1 month
- (8) Mortality at 6 weeks

Risk of bias legend

- (A) Bias arising from the randomization process
- (B) Bias due to deviations from intended interventions: Mortality
- (C) Bias due to missing outcome data: Mortality
- (D) Bias in measurement of the outcome: Mortality
- (E) Bias in selection of the reported result: Mortality
- (F) Overall bias: Mortality

Two trials were judged at high risk of bias for this result (Albrecht 2014; De La Tabla 2010). The study Albrecht 2014 was judged as at high risk for selection of the reported result due to the fact that mortality was not an outcome for this trial, and that no other outcome had this specific time point for measurement when the trial was registered. The study De La Tabla 2010 was judged at high risk for randomization process due to the fact that groups were of very unequal sizes (i.e. 11 participants allocated to the intervention group and 38 participants allocated to the comparator group).

With exclusion of the two trials at high risk of bias (Albrecht 2014; De La Tabla 2010), the estimate would be RR 0.81 (95% CI 0.42 to 1.59).

Egger's regression intercept showed no significant evidence of a small-study effect. Correcting for the possibility of publication bias with Duval and Tweedie's trim and fill analysis would yield an estimate of RR 0.78 (95% CI 0.41 to 1.51). Given an incidence of 9.8%, 3228 participants (1614 per group) would have been required to eliminate a 25% reduction (alpha 0.05; beta 0.2; one-sided test).

Level of certainty for mortality within six months

We did not downgrade for risk of bias because excluding the two trials judged as at high risk of bias would not change the conclusion. We noted no heterogeneity. We used direct comparisons only with studies performed on the population of interest, and this is not a surrogate marker. Correcting for the possibility of publication

bias would not change the conclusion. We downgraded the level of evidence by two for imprecision because the confidence interval included both absence of effect and important benefit. We rated the level of certainty as low.

3. Time to first mobilization

Findings of three trials with 208 participants show that PNBs reduced time to first mobilization (MD -10.80, 95% CI -12.83 to -8.77 hours; $I^2 = 41\%$; [Analysis 1.6](#)) ([Kullenberg 2004](#); [Segado Jimenez 2009](#); [Yamamoto 2016](#)).

All three trials were judged as at low risk of bias for this outcome.

Egger's regression intercept showed no evidence of a small-study effect. Correcting for the possibility of publication bias would yield an estimate of MD -11.17 hours (95% CI -13.07 to -9.26).

Level of certainty for time to first mobilization

We did not downgrade the level of certainty for risk of bias because no trial was judged at high risk of bias. We downgraded certainty by one level for a moderate amount of heterogeneity. We used direct comparisons only with studies performed on the population of interest, and this is not a surrogate marker. We did not downgrade evidence for imprecision. The effect was still present with correction for the possibility of publication bias. We rated the level of certainty as moderate.

4. Costs of analgesic regimens

One trial with 75 participants reported that costs related to analgesia were reduced when PNBs were given as a single-injection PNB (MD -4.40 euros (2009 value), 95% CI -4.84 to -3.96; [Analysis 1.7](#)) compared to no nerve block ([Segado Jimenez 2009](#)). [Segado Jimenez 2009](#) was judged as at low risk of bias for this outcome.

Level of certainty for costs of analgesic regimens

The trial was not at high risk of bias. The comparison was a direct one. We downgraded the evidence by two levels for the small number of trials included. We could not assess publication bias. We rated the level of certainty as low.

Complications

Complications of analgesic techniques can be found in [Table 2](#).

DISCUSSION

Summary of main results

We found some advantages of peripheral nerve block (PNB) versus systemic analgesia alone for pain treatment in people with hip fracture. Compared with systemic analgesia, pain on movement within 30 minutes after block placement will be less by approximately 2.5 out of 10 ([Analysis 1.1](#); [Summary of findings 1](#)). This represents a clear and undeniable advantage over systemic analgesia, especially in this era of opioid crisis.

Acute confusional state is common after hip fracture and may delay rehabilitation, may increase hospital length of stay, and may impede nursing home placement and even increase risk for mortality ([Pompei 1994](#)). PNBs reduce the risk of acute confusional state (risk ratio (RR) 0.67, 95% confidence interval (CI) 0.50 to 0.90; [Analysis 1.2](#); [Summary of findings 1](#)). The pathophysiology of acute confusional state in these patients may

be multifactorial and may include side effects of medications used, hypoxaemia, immobilization, infection, and systemic inflammation ([Mouzopoulos 2009](#)). PNBs (or local anaesthetics) may have an influence on any of these factors. Also, PNBs are associated with a reduction in opioid consumption ([Guay 2017](#)).

We could not demonstrate a reduction in the incidence of myocardial infarction ([Summary of findings 1](#)). We found it odd that only one trial reported on the risk of myocardial infarction with PNBs ([Altermatt 2013](#)). Although the number of participants included in this trial was relatively small, study authors monitored ST segments continuously up to three days after surgery. They reported no difference in ischaemic episodes with a continuous psoas compartment block. This contrasts with results reported by Schenin and colleagues (i.e. a reduction in myocardial ischaemic episodes with an epidural infusion of bupivacaine and fentanyl) ([Scheinin 2000](#)). Epidural analgesia has been reported to reduce myocardial infarction in high-risk patients undergoing high-risk surgery ([Guay 2016a](#)).

Chest infections were reduced with PNBs ([Analysis 1.4](#); [Summary of findings 1](#)). This could be due to reduced time to first mobilization ([Analysis 1.6](#)).

We did not find a reduction in short-term (up to six months) mortality rate ([Analysis 1.5](#); [Summary of findings 1](#)), but participants were too few to allow definitive conclusions on this.

Compared with systemic analgesia alone, adding a single-injection PNB will make little or no difference in the cost of analgesic drugs (equivalent to -4 euros per patient in 2009).

Only one trial ([Deniz 2014](#)) reported one major complication: a sensory/motor deficit lasting four months with a femoral nerve block ([Table 2](#)). This is consistent with information derived from large prospective studies indicating that the incidence of nerve injury lasting longer than six months associated with femoral nerve block would be relatively low, at 0 to 1.2 per 1000 procedures ([Auroy 2002](#); [Brull 2007](#); [Sites 2012](#)).

Overall completeness and applicability of evidence

We are confident that our results reflect the actual available literature. More data may be required to evaluate the effects of PNBs on myocardial infarction and death. Indeed the number of participants included for these two outcomes was still below the optimal information size. The population included in these trials reflects quite well the overall adult population with hip fracture, with the exception of patients with dementia, who were often excluded from randomized controlled trials. Furthermore, the low incidence of major complications related to PNBs in this review has probably been made possible by adherence of study authors to recommendations of major societies on the topic. Some recommendations on the prevention of infectious and bleeding complications for each type of regional anaesthetic technique are available at www.asra.com/advisory-guidelines.

Quality of the evidence

We have summarized the certainty of evidence in [Summary of findings 1](#). We quantified the level of certainty as high for reduced pain on movement and for acute confusional state, and as moderate for reduced chest infection. Although some studies

might not have been perfect, excluding studies at high risk of bias did not change any of our conclusions. The quality of evidence was most often reduced by insufficient numbers of included participants (myocardial infarction, chest infection, death, time to first mobilization, and cost of analgesia).

Potential biases in the review process

Our search was extensive. We chose factors for exploration of heterogeneity a priori. Trials reporting on outcomes included in our summary of findings were evaluated with the Cochrane Risk of Bias-2 tool. Certainty was evaluated according to the GRADE system.

Cochrane is introducing a new tool for quality evaluation of randomized controlled trials: Risk of Bias-2. Compared with the previous tool, all trials are now assessed for each domain specifically for each outcome. Indeed evaluation of the quality of a trial may vary according to the outcome for which it is evaluated. Domains are also reorganized differently, and the process of evaluation is much more detailed and extensive (see details under [Characteristics of included studies](#)). Using this new tool, very few results had trials at high risk of bias.

Regional blockade is a topic for which adequate blinding of participants and personnel taking care of participants is rarely feasible. A simple evaluation of block effectiveness is incompatible with preserved blinding. Blinding of outcome assessors and at least of the researcher analysing data should, however, often be feasible. Therefore, clarity on how allocation is concealed until the time the participant has been included in the trial and formally attributed to his/her treatment group and to blinding of outcome assessors, as well as of the researcher analysing data, represents domains on which study authors could try to improve the quality of future trials.

Agreements and disagreements with other studies or reviews

Even at rest, the level of pain after hip fracture is relatively high, particularly among those with subtrochanteric fracture (median 5 out of 10) ([Foss 2005a](#)). Movement by these individuals immediately after injury is unavoidable: transport from the scene of injury to the hospital, unclothing for medical examination, transport for X-ray diagnostic confirmation, transfer to the operating room table, positioning for spinal anaesthesia, etc. Movement-associated median pain ranges from 8 to 10 out of 10, depending on the type of fracture (intracapsular = 8; trochanteric = 9; subtrochanteric = 10) ([Foss 2005a](#)).

In our latest previous version of this review ([Other published versions of this review](#)), we included 31 trials with 1760 participants. We found that PNBs reduce pain and chest infection. Based on the evidence available at the time, we did not find a difference between PNBs and other modes of analgesia in terms of acute confusional state, but the number of participants included in the 2017 version was insufficient to eliminate a difference in the risk of acute confusional state. In the present version, we included 49 trials with 3061 participants. We confirmed that PNBs reduced pain on movement within 30 minutes after block placement and chest infection. We also found a reduction in acute confusional state.

In [Appendix 6](#), we have summarized the main findings of recent reviews on this topic published in the English language ([Amin 2017](#); [Dizdarevic 2019](#); [Fadhilillah 2019](#); [Freeman 2016](#); [Hards 2018](#);

[Hartmann 2017](#); [Hong 2019](#); [Hsu 2018](#); [Hsu 2019](#); [Parker 2016](#); [Rashiq 2013](#); [Scurrah 2018](#); [Skjold 2019](#); [Soffin 2019](#); [Steenberg 2018](#)). These reviews included between 2 and 25 trials. Most reviews focused on effects of PNBs on acute pain and confirmed our findings for this outcome. Many reviews evaluated only one specific block compared to systemic analgesia alone (i.e. either a fascia iliaca compartment block or a femoral nerve block). Therefore it is not surprising that none of these reviews included sufficient participants for evaluation of effects of PNBs on major morbidity or mortality. Indeed, chest infection and acute confusional state were not included as outcomes in most of these reviews.

Our review did not include enough participants with adequate follow-up to evaluate the effects of adding PNBs on mortality in this population with a high level of certainty. A retrospective chart review on 535 patients evaluated the effects of a comprehensive programme, including a switch from systemic opiates to a local anaesthetic femoral nerve catheter block, an earlier assessment by the anaesthesiologist, and a more systematic approach to nutrition, fluid, oxygen therapy, and urinary retention ([Pedersen 2008](#)). Investigators reported that overall 12-month mortality was 29% in the control group and 23% in the intervention group ($P = 0.2$).

AUTHORS' CONCLUSIONS

Implications for practice

The present review shows that peripheral nerve blocks (PNBs) reduce pain on movement at 30 minutes after block placement, as well as the risk of an acute confusional state and probably also the risk of chest infection, compared with systemic analgesia alone. Whether or not these benefits justify the use of PNBs in clinical practice probably has to be judged on a case-by-case basis. Although randomized clinical trials may not be the best way to establish risks associated with an intervention, our review confirms the low risk of permanent injury associated with PNBs, as found by others ([Neal 2015](#)).

Included trials often excluded patients with dementia ([Characteristics of included studies](#)). These patients may be uncooperative and less suitable for awake regional anaesthetic techniques. The American Society of Regional Anesthesia suggests that regional anaesthetic techniques should not be performed routinely in adult patients whose sensorium is compromised by general anaesthesia or deep sedation ([Neal 2015](#)). However, adult patients with specific conditions (e.g. developmental delay) may be appropriate exceptions to this recommendation after risk versus benefit is considered ([Neal 2015](#)).

The purpose of our review was not to evaluate the relative efficacy of various nerve blocks. However, when looking at our results on pain scores, we found no compelling evidence to favour a femoral nerve block over a fascia iliaca block ([Analysis 1.1](#)). This observation, which was based on a single subgroup analysis (indirect evidence), should be interpreted very cautiously. Having said this, and given a femoral nerve block requiring a needle position closer to the nerve and, hence, perhaps increasing the risk of inadvertent intraneural injection, we are inclined to favour the use of fascia iliaca compartment blocks for this population. Risks of inadvertent intravascular injection with systemic local anaesthetic toxicity are present with both techniques but may be decreased with the use of ultrasound

guidance ([Sites 2014](#)). Use of an intravascular marker ([Guay 2006a](#)), repeated aspirations, and slow injection of fractionated doses have also been suggested to decrease the risks of inadvertent intravascular injection of large amounts of local anaesthetics. Finally, adapting doses to a patient's clinical condition and capacity to metabolize and excrete the drug and its metabolites is also part of good clinical practice ([Pere 2011](#); [Shammas 1998](#)).

Implications for research

Given that high-certainty evidence shows that PNBs reduce pain and acute confusional state and moderate-certainty evidence indicates that PNBs probably also reduce chest infection compared with systemic analgesia alone, we are reluctant to encourage further randomized controlled trials comparing PNBs with systemic analgesia alone. If patients accept PNBs and have no contraindication to their use, and if the expertise and resources needed to perform them safely are available, we no longer consider it appropriate for patients with a hip fracture to be administered a placebo or sham intervention. We think that evidence is sufficient to support the use of PNBs in patients with hip fracture. However, the ideal technique of PNB (injection site, type of local anaesthetic, dose, the addition of an infusion or not, etc.) may warrant further exploration. Also, good-quality non-randomized trials with appropriate sample sizes may help to clarify the potential effects of PNBs on myocardial infarction and mortality ([Analysis 1.5](#)).

ACKNOWLEDGEMENTS

The review authors thank Janne Vendt, who designed the search strategy for this update, as well as University of

Sherbrooke, University Laval, and University of Quebec in Abitibi-Temiscamingue, for granting access to electronic databases and to medical journals.

We would like to thank Lars Lundstrøm (Content Editor), Jing Xie (Statistical Editor), Pekka Tarkkila and Fernanda Fukushima (Peer Reviewers), Gabriel Kwok (Consumer Reviewer), Liz Bickerdike (Network Associate Editor), Janne Vendt (Information Specialist), Teo Quay (Managing Editor), and Andrew Smith (Co-ordinating Editor) for their help and editorial advice during the preparation of this systematic review. We would also like to thank the Cochrane Editorial and Methods Department's 'Methods Support Unit' for their advice and support related to implementation of Risk of bias-2 as part of the pilot programme.

We thank Eric Albrecht ([Albrecht 2014](#)), Fernando Altermatt ([Altermatt 2013](#)), Raquel Ortiz de la Tabla González ([De La Tabla 2010](#)), Jochen Gille ([Gille 2006](#)), Nicolai B Foss ([Foss 2005a](#)), K. Sanem Cakar Turhan ([Gürtan Bölükbaşı 2013](#)), Daniel Godoy Monzon ([Godoy Monzon 2010](#)), Ashok Jadon ([Jadon 2014](#)), Francesca L Beaudoin ([Liebmann 2012](#)), Pär Wennberg ([Landsting 2008](#)), Hongling Nie ([Nie 2015](#)), Harry Scheinin ([Scheinin 2000](#)), Szilard Szucs ([Szucs 2010](#)), and M Yung ([Yun 2009](#)), who provided additional information for the 2017 and 2020 updates; Karl Sales for translation of two articles ([Segado Jimenez 2009](#); [Segado Jimenez 2010](#)); Gideon Heinert for translation of [Gille 2006](#); and Jia Jiang for translation of [Ma 2018a](#).

We also thank Martyn Parker and Richard Griffiths, co-authors of previous versions, who read this version during the revision process.

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CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Albrecht 2014

Study characteristics

Methods	Parallel RCT
	Approved by the ethics committee and informed consents obtained
	Site: Lausanne University Hospital, Switzerland

Sterne 2019

Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *British Medical Journal* 2019;**366**:l4898. [DOI: [10.1136/bmj.l4898](https://doi.org/10.1136/bmj.l4898)] [PMID: 31462531]

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* Indicates the major publication for the study

Albrecht 2014 (Continued)

Data collection: between 7 November 2014 and 2 June 2016

Funding: departmental/institutional

Registration: NCT02433548

Participants	<p>30 participants with a hip fracture</p> <p>Excluded: patients with bleeding disorder or presence of anticoagulation, periprosthetic fracture, a known polyneuropathy, body weight < 40 kg, chronic pain condition, patients undergoing chemotherapy, infection at the site of injection, allergy to local anaesthetics, cognitive disorder</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: not mentioned</p> <p>Surgical technique: not mentioned</p> <p>Mean age: 80.5 years (range 73 to 90)</p> <p>Percentage female: 70%</p> <p>Length of follow-up: 3 months</p>
Interventions	<p>Intervention: fascia iliaca compartment block (N = 15)</p> <p>Comparator: sham block (N = 15)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain scores at rest and on movement at 45 minutes. 2. Mortality. 3. Opioid consumption at 24 hours. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Hospital length of stay.
Notes	<p>Conflict of interest: no conflicts of interest from any study authors related to this work</p> <p>DOI: 10.1186/s12877-019-1193-0</p> <p>Email sent on 5 January 2020: additional information received from study authors</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Non-commercial trial registry record. 3. Personal communication with trialist.

Altermatt 2013

Study characteristics

Methods	<p>RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Pontificia Universidade Católica de Chile</p> <p>Data collection: 2 years; exact dates unspecified</p> <p>Funding: governmental</p>
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Peripheral nerve blocks for hip fractures in adults (Review)

Altermatt 2013 (Continued)

Registration: retrospectively registered; NCT01961895

Participants	<p>31 ASA II to III participants older than 60 years, with risk factors for known coronary artery disease (≥ 2 risk factors for coronary heart disease as defined by Wallace 1987) and hip fracture, admitted within 48 hours of fracture</p> <p>Excluded: patients with ≥ 2 independent predictors of perioperative cardiac adverse events (age ≥ 68, body mass index ≥ 30 kg/m², active congestive heart failure, previous cardiac intervention, cerebrovascular disease or hypertension); receiving orthopaedic treatment; with evidence of abnormal cognitive function, dementia, or delirium; with non-sinus heart rhythm or conduction abnormalities (complete left or right bundle branch blocks, or atrioventricular block); no electrocardiogram at admission; patients with a pacemaker, coagulopathy, contraindication to anaesthesia or regional analgesia, severe liver or renal failure (creatinine > 2.0 mg.dL⁻¹), or known allergy to a drug used in the study</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: not mentioned</p> <p>Mean age: 81 years (range not mentioned) Percentage female: 77%</p> <p>Length of follow-up: in-hospital (mean 7.6 days and 8.2 days)</p>
Interventions	<p>Intervention: continuous psoas compartment block (N = 17)</p> <p>Comparator: no nerve block (N = 14)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Myocardial infarction. 2. Myocardial ischaemia. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Hospital length of stay. 2. Congestive heart failure. 3. Arrhythmia. <p>Ischaemic events per participant (extracted as P value): continuous EKG monitoring and serial cardiac enzymes</p>
Notes	<p>Conflict of interest: "authors declare having no conflict of interest"</p> <p>DOI: 10.1016/j.bjan.2018.03.003</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Non-commercial trial registry record. 3. Conference abstract about the trial. 4. Personal communication with trialist.

Antonopoulou 2006
Study characteristics
Peripheral nerve blocks for hip fractures in adults (Review)

Antonopoulou 2006 (Continued)

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained: not mentioned Site: General Hospital of Xanthi, Greece Data collection: no information Funding: no information Registration: no information
Participants	84 participants with hip fracture (48 intracapsular fractures, 36 extracapsular fractures) Excluded: no information Type of fracture: 48 patients had an intracapsular fracture; 36 patients had an extracapsular fracture Anaesthetic technique for surgery: spinal block Surgical technique: not mentioned Mean age: 76 years (range 68 to 95) Percentage female: 75% Lost to follow-up: no information Length of follow-up: in-hospital
Interventions	Intervention: continuous femoral nerve block (N = 49) Comparator: no nerve block (N = 35) Spinal anaesthesia and paracetamol after surgery for all participants
Outcomes	Relevant to this review. 1. Pain. 2. Complications. Not relevant to this review. 1. Participants requiring rescue analgesia.
Notes	Conflict of interest: no information DOI: no information Conference abstract Email sent on 25 May 2015: no reply

Bang 2016

Study characteristics

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: The Catholic University of Korea, Seoul, Korea Data collection: 2015 to 2016
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Peripheral nerve blocks for hip fractures in adults (Review)

Bang 2016 (Continued)

	<p>Funding: departmental/institutional</p> <p>Registration: KCT0001450</p>
Participants	<p>22 participants aged 70 to 90 years who underwent bipolar hemiarthroplasty for femoral neck fracture</p> <p>Excluded: clinically significant coagulopathy, infection at the injection site, allergy to local anaesthetics, severe cardiopulmonary disease (\geq ASA IV), body mass index > 35 kg/m², diabetic or other neuropathies, receiving opioids for long-term analgesic therapy, contraindication to spinal anaesthesia, inability to comprehend verbal/visual analogue pain scale, patient-controlled analgesia device</p> <p>Type of fracture: femoral neck fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: bipolar hemiarthroplasty</p> <p>Mean age: 81.8 years (range not mentioned)</p> <p>Percentage female: 67%</p> <p>Length of follow-up: 1 week</p>
Interventions	<p>Intervention: fascia iliaca compartment block (N = 11)</p> <p>Comparator: no nerve block (N = 11)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain scores after surgery. 2. Analgesic requirements after surgery. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Postoperative nausea and vomiting. 2. Pruritus. 3. Blood loss.
Notes	<p>Conflict of interest: none</p> <p>DOI: 10.1097/MD.00000000000005018</p> <p>Email sent on 5 January 2020</p>

Brownbridge 2018

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: University Hospital, Saskatoon, Canada</p> <p>Data collection: May 2018 to March 2019</p> <p>Funding: departmental/institutional</p> <p>Registration: NCT03588689</p>
Participants	<p>30 participants ≥ 65 years of age admitted for hip fracture</p>

Peripheral nerve blocks for hip fractures in adults (Review)

Brownbridge 2018 (Continued)

Excluded: ASA score ≥ 4 , open fracture; concomitant injury that might interfere with positioning; local anaesthetic allergy; delirium or cognitive impairment preventing consent; infection or previous surgery at the femoral triangle; using warfarin, anti-Xa inhibitors, or long-term opioids

Type of fracture: hip fracture

Anaesthetic technique for surgery: spinal block or general anaesthesia

Surgical technique: not mentioned

Mean age: not mentioned (range ≥ 65 years old)

Percentage female: no information

Length of follow-up: 1 month

Interventions	<p>Intervention: continuous fascia iliaca block (N = 15)</p> <p>Comparator: no nerve block (N = 15)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Confusion. 3. Pneumonia. 4. Mortality at 30 days post discharge. 5. Opioid consumption. 6. Complications. <p>Not relevant to this review:</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Hospital length of stay.
Notes	<p>Conflict of interest: "none declared"</p> <p>DOI: 10.1007/s12630-019-01428-2</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Non-commercial trial registry record.

Chudinov 1999

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee</p> <p>Site: Sheba Medical Center, Ramat Gan, Israel</p> <p>Data collection: not mentioned</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	40 participants (30 female and 10 male) with hip fracture undergoing surgery

Peripheral nerve blocks for hip fractures in adults (Review)

Chudinov 1999 (Continued)

Excluded: severe cardiac, pulmonary, renal, or liver dysfunction; systemic infection; decubitus ulcer; dementia; aspirin or anticoagulant treatment; allergy to local anaesthetics

Type of fracture: hip fracture

Anaesthetic technique for surgery: according to assessment, a sciatic nerve block (N = 5), general anaesthesia (N = 1), or spinal anaesthesia (N = 11) was added for participants in the intervention group; neuraxial block (spinal or epidural, N = 19) or general anaesthesia (N = 1) was used for participants in the comparator group

Surgical technique: not mentioned

Mean age: 80 years (range 67 to 96)

Percentage female: 75%

Length of follow-up: 72 hours

Interventions	<p>Intervention: continuous psoas compartment block (N = 20)</p> <p>Comparator: no nerve block (N = 20)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Participant satisfaction (binary scale). 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Haemodynamic variables.
Notes	<p>Conflict of interest: not stated</p> <p>DOI: n/a</p> <p>No email address</p>

Coad 1991

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and consents obtained</p> <p>Site: Derbyshire Royal Infirmary, Nottingham, UK</p> <p>Data collection: not mentioned</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>50 participants with a hip fracture undergoing surgery with a pin and plate or a sliding hip screw</p> <p>Excluded: receiving analgesic drugs, diagnosis of dementia, regional anaesthesia considered indicated for surgery</p> <p>Type of fracture: hip fracture</p>

Coad 1991 (Continued)

	<p>Anaesthetic technique for surgery: general anaesthesia</p> <p>Surgical technique: pin and plate or compression/screw fixation</p> <p>Mean age: 77 years (range 64 to 89)</p> <p>Percentage female: 84%</p> <p>Length of follow-up: 24 hours</p>
Interventions	<p>Intervention 1: lateral femoral cutaneous nerve block (N = 17)</p> <p>Intervention 2: femoral (3-in-1) nerve block (N = 17)</p> <p>Comparator: no nerve block (N = 16)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioids. 2. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Rescue analgesia. 2. Duration of analgesia.
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>No email address</p>

Cuvillon 2007
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and written informed consents obtained</p> <p>Site: Centre Hospitalier Universitaire de Nîmes, France</p> <p>Data collection: September 1999 to June 2002</p> <p>Funding: charity</p> <p>Registration: no information</p>
Participants	<p>62 ASA physical status I to IV, ≥ 70 years of age, with proximal end femur fracture undergoing surgery</p> <p>Excluded: more than 72 hours between fracture and surgery, weight < 40 kg, ASA physical status > IV, neurological disease (alcoholic or diabetic), allergy or contraindication to regional anaesthesia, severe hepatic or renal dysfunction, Mini Mental score < 15/30</p> <p>Type of fracture: proximal end femur fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: plate and screw (58%) or intermediate prosthesis (42%)</p> <p>Mean age: 82 years (range not stated)</p> <p>Percentage female: 86%.</p> <p>Length of follow-up: in-hospital</p>

Cuvillon 2007 (Continued)

Interventions	Intervention: continuous femoral nerve block (N = 21) Comparator: no nerve block (N = 41)
Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Mortality. 4. Pneumonia. 5. Time to first mobilization after surgery. 6. Cost of analgesic regimens. 7. Opioid requirement. 8. Pressure sores. Not relevant to this review. <ol style="list-style-type: none"> 1. Transfused.
Notes	Conflict of interest: not mentioned DOI: 10.1016/j.annfar.2006.06.025 Study authors contacted 22 May 2015; no reply Sources obtained for risk of bias assessment. <ol style="list-style-type: none"> 1. Journal article with results of the trial.

De La Tabla 2010
Study characteristics

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: Valme Hospital, Seville, Spain Data collection: no information Funding: no information Registration: no information
Participants	49 participants older than 65 years with a neck fracture scheduled for surgical treatment Excluded: not stated Type of fracture: neck fracture Anaesthetic technique for surgery: not stated Surgical technique: not stated Mean age: 81.9 years (range not stated) Percentage female: % not stated Length of follow-up: 1 month
Interventions	Intervention: continuous femoral nerve block (N = 11)

Peripheral nerve blocks for hip fractures in adults (Review)

De La Tabla 2010 (Continued)

Comparator: no nerve block (N = 38)

Outcomes	Relevant to this review. 1. Pain. 2. Mortality. Not relevant to this review. 1. None stated.
Notes	Conflict of interest: no information DOI: n/a Conference abstract Additional information on pain scores received from study authors for the 2017 version Email sent on 5 January 2020 Sources obtained for risk of bias assessment. 1. Conference abstract about the trial. 2. Personal communication with trialist.

Deniz 2014
Study characteristics

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: military university hospital, Anakara, Turkey Data collection: between June 2009 and May 2010 Funding: departmental/institutional Registration: no information
Participants	70 participants who underwent hip prosthesis for hip fracture under general anaesthesia Excluded: spinal or epidural anaesthesia, ASA physical status \geq IV, weight < 40 kg or > 125 kg, inguinal or femoral hernia, allergy to local anaesthetics, peripheral neuropathy, neurological deficit or abnormal coagulation profile, mental retardation, dementia, insufficient understanding of pain scoring systems, use of patient-controlled analgesia device Type of fracture: hip fracture Anaesthetic technique for surgery: general anaesthesia Surgical technique: hip prosthesis Mean age: 63 years (range 20 to 80 years) Percentage female: 55% Length of follow-up: 4 months
Interventions	Intervention 1: fascia iliaca compartment block (N = 24)

Deniz 2014 (Continued)

Intervention 2: 3-in-1 femoral nerve block (N = 24)

Comparator: no nerve block (N = 22)

Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain scores. 2. Opioid consumption. 3. Complications. Not relevant to this review. <ol style="list-style-type: none"> 1. Stress hormones. 2. Haemodynamic variables. 3. Nausea. 4. Sedation.
Notes	Conflict of interest: "none declared" DOI: 10.5505/agri.2014.76993 No email address

Diakomi 2014
Study characteristics

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: University of Athens School of Medicine, Greece Data collection: 4-month period; exact dates not specified Funding: no information Registration: NCT02037633
Participants	41 ASA I to III participants scheduled for hip fracture repair Excluded: contraindications for central nervous blockade, impaired cognition or dementia, multiple fractures, any previous analgesic administration in last 12 hours before surgery Type of fracture: intertrochanteric (60%) or neck (40%) fracture Anaesthetic technique for surgery: spinal block Surgical technique: not stated Mean age: 78 years (range 38 to 94) Percentage female: 78.6% Length of follow-up: 48 hours
Interventions	Intervention: fascia iliaca block (N = 21) Comparator: no nerve block (N = 20)
Outcomes	Relevant to this review.

Diakomi 2014 (Continued)

1. Pain.
2. Opioid requirement.
3. Participant satisfaction (provided as number satisfied or not).
4. Complications.

Not relevant to this review.

1. Quality of positioning for spinal block.
2. Time required to perform spinal block.
3. Haemodynamic variables.
4. Time to first request for analgesics.

Notes

Conflict of interest: no information

DOI: 10.1097/AAP.0000000000000133

Email sent on 5 January 2020

Sources obtained for risk of bias assessment.

1. Journal article with results of the trial.
2. Non-commercial trial registry record.
3. Conference abstract about the trial.

Domac 2015
Study characteristics
Methods

Parallel RCT

Approved by the ethics committee and informed consents obtained

Site: Samsun, Turkey

Data collection: no information

Funding: departmental

Registration: no information

Participants

40 ASA I to III participants undergoing hip fracture repair under spinal anaesthesia

Excluded: < 65 years of age or > 80 years of age, peripheral neurological disease, mental disorder, allergy to amide local anaesthetics, coagulation/haemostasis disease, moderate or severe liver or kidney failure, contraindication to or refusing fascia iliaca block

Type of fracture: hip fracture

Anaesthetic technique for surgery: spinal block

Surgical technique: not mentioned

Mean age: 70.5 years (range 65 to 80)

Percentage female: 62.5%

Length of follow-up: 48 hours

Interventions

Intervention: fascia iliaca block (N = 20)

Comparator: no nerve block (N = 20)

Domac 2015 (Continued)

Outcomes	Relevant to this review.
	<ol style="list-style-type: none"> 1. Pain. 2. Opioid requirements. 3. Participant satisfaction.
	Not relevant to this review.
	<ol style="list-style-type: none"> 1. Quality of positioning for spinal block. 2. Onset of spinal block. 3. Duration of analgesia. 4. Opioid side effects. 5. Haemodynamic variables. 6. Cognitive function. 7. Haemodynamic variables.
Notes	<p>Conflict of interest: "authors do not report any conflict of interest"</p> <p>DOI: n/a</p> <p>SDs of 0.00 entered as 0.001</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial.

Fletcher 2003

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Rotherham General Hospital, UK</p> <p>Data collection: 6-month period from February until August; exact years unspecified</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>50 participants with a neck of femur fracture</p> <p>Excluded: confused (and therefore unable to give informed consent), bleeding diathesis or taking warfarin, local or systemic infection, previous hypersensitivity to local anaesthetics</p> <p>Type of fracture: intertrochanteric (60%) and subcapital-transcervical (40%)</p> <p>Anaesthetic technique for surgery: not mentioned</p> <p>Surgical technique: not mentioned</p> <p>Mean age: 78 years (range not stated)</p> <p>Percentage female: 70%</p> <p>Length of follow-up: 6 months</p>

Fletcher 2003 (Continued)

Interventions	Intervention: femoral (3-in-1) nerve block (N = 24) Comparator: no nerve block (N = 26)
Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain (4-point scale). 2. Pneumonia. 3. Mortality. 4. Opioids. 5. Complications. Not relevant to this review. <ol style="list-style-type: none"> 1. Haemodynamic variables. 2. Opioid side effects. 3. Time to best response to analgesia. 4. Deep venous thrombosis.
Notes	Conflict of interest: no information DOI: 10.1067/mem.2003.51 Extra information supplied by trialists to confirm secure randomization and that no participants were lost to follow-up Study authors re-contacted 22 May 2015: no reply Sources obtained for risk of bias assessment. <ol style="list-style-type: none"> 1. Journal article with results of the trial.

Foss 2005a
Study characteristics

Methods	Parallel RCT Approved by the ethics committee and written informed consents obtained Site: Hvidovre University Hospital, Denmark Data collection: May 2003 to January 2006 Funding: charity Registration: NCT00162630
Participants	48 participants with hip fracture Excluded: refusal to participate in the study, previous surgery in the affected hip, regular prefracture opioid or glucocorticoid therapy, alcohol or substance abuse, infection at the injection site, morphine intolerance, any previous opioid administration for acute pain, non-confirmation of hip fracture suspicion on X-ray Type of fracture: intracapsular (37.5%), subtrochanteric (48%), trochanteric (14.5%) Anaesthetic technique for surgery: not mentioned Surgical technique: not mentioned

Peripheral nerve blocks for hip fractures in adults (Review)

Foss 2005a (Continued)

Mean age: 80 years (range 69 to 88)
Percentage female: 73%
Length of follow-up: in-hospital

Interventions	<p>Intervention: fascia iliaca compartment blockade (N = 24)</p> <p>Comparator: sham block with saline (N = 24)</p> <p>After 3 hours, all participants received epidural analgesia</p>
Outcomes	<p>Relevant to this review.</p> <p>1. Pain.</p> <p>Not relevant to this review.</p> <p>1. Opioid side effects.</p> <p>2. Haemodynamic variables.</p>
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>Email sent on 5 January 2020; study authors think that their published report should contain the information that we need; study authors available to answer additional questions</p> <p>Sources obtained for risk of bias assessment.</p> <p>1. Journal article with results of the trial.</p> <p>2. Non-commercial trial registry record.</p> <p>3. Personal communication with trialist.</p>

Gille 2006
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: St.Georg, Leipzig, Germany</p> <p>Data collection: no information</p> <p>Funding: corresponding study author had no relationship with any mentioned product nor competitors classified as departmental resources</p> <p>Registration: no information</p>
Participants	<p>100 participants with an isolated hip fracture</p> <p>Excluded: < 18 years old, uncooperative, with contraindications to regional anaesthesia or drugs used in the protocol, long-term use of opioids and/or opioid dependence, history of ulcers, multiple trauma, absence of consent, anaesthetists inexperienced (fewer than 5) with the technique</p> <p>Type of fracture: intracapsular (43%), extracapsular (57%)</p> <p>Anaesthetic technique for surgery: spinal (75%) or general anaesthesia (25%)</p> <p>Surgical technique: prosthesis (41%), osteosynthesis (59%)</p> <p>Mean age: 80 years (range 35 to 103)</p>

Gille 2006 (Continued)

Percentage female: 77%
Length of follow-up: 72 hours

Interventions	Intervention: continuous femoral nerve block (N = 50) Comparator: no nerve block (N = 50)
Outcomes	Relevant to this review. 1. Pain. 2. Complications. Not relevant to this review. 1. Opioid side effects.
Notes	Conflict of interest: "there is no conflict of interest" DOI: 10.1007/s00101-005-0949-4 Email sent on 5 January 2020 Sources obtained for risk of bias assessment. 1. Journal article with results of the trial.

Godoy Monzon 2010

Study characteristics

Methods	Parallel RCT Approved by the ethics committee and signed informed consents obtained Site: Hospital Italiano de Buenos Aires-Centro Agustín Rocca, San Justo-La Matanza, Argentina (university hospital) Data collection: June 2006 to January 2008 Funding: departmental/institutional Registration: not registered
Participants	175 adult participants > 65 years old who presented to the emergency department because of a previously undiagnosed and untreated hip fracture Excluded: anatomical abnormalities in the inguinal area different from fracture, known coagulation disorder, history of allergy to any of the active ingredients used during the study, refusal to participate Type of fracture: hip fracture Anaesthetic technique for surgery: not mentioned Surgical technique: not mentioned Median age: 75.9 years (range not mentioned) Percentage female: 62.3% Length of follow-up: 8 hours
Interventions	Intervention: fascia iliaca compartment block (N = 92)

Godoy Monzon 2010 (Continued)

Comparator: sham block with saline (N = 62)

Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Haemodynamic variables.
Notes	<p>Conflict of interest: "none"</p> <p>DOI: 10.1007/s12245-010-0234-4</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Personal communication with the trialist.

Graham 2008
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed written consents obtained</p> <p>Site: The Chinese University of Hong Kong, Trauma & Emergency Centre, Prince of Wales Hospital, Shatin, N.T., Hong Kong, China</p> <p>Data collection: April 2000 to October 2001</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>40 adult participants (> 16 years of age) with adequate abbreviated mental tests and hip fracture confirmed by X-ray</p> <p>Excluded: known allergy or contraindication to morphine or bupivacaine, abbreviated mental test score < 9</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: no information</p> <p>Surgical technique: no information</p> <p>Mean age: 79.2 years (range: not stated)</p> <p>Percentage female: 93.5%</p> <p>Length of follow-up: 24 hours</p>
Interventions	<p>Intervention: femoral (3-in-1) nerve block (N = 18)</p> <p>Comparator: no nerve block (N = 22)</p>

Graham 2008 (Continued)

Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Opioids. 4. Complications. Not relevant to this review: <ol style="list-style-type: none"> 1. Time to perform the block
Notes	Conflict of interest: no information DOI: n/a Email sent on 5 January 2020 Sources obtained for risk of bias assessment. <ol style="list-style-type: none"> 1. Journal article with results of the trial.

Gürtan Bölükbaşı 2013
Study characteristics

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: Ankara University Medical School, Turkey Data collection: no information Funding: no information Registration: no information
Participants	31 ASA I to III participants undergoing hip fracture surgery under spinal anaesthesia Excluded: no information Type of fracture: hip fracture Anaesthetic technique for surgery: spinal block Surgical technique: surgery for hip fracture Mean age: no information (range 60 to 90) Percentage female: no information Length of follow-up: no information
Interventions	Intervention: fascia iliaca compartment block (N = 15) Comparator: no nerve block (N = 16)
Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain. Not relevant to this review.

Gürtan Bölükbaşı 2013 (Continued)

1. Quality of positioning.
2. Haemodynamic variables.
3. Opioid side effects.
4. Quality of sleep.

Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>Study authors contacted on 25 May 2015. Confirmed that they were the authors of the abstracts but did not provide requested information</p>
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Haddad 1995

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Stevenage, UK</p> <p>Data collection: no information</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>50 participants with an extracapsular hip fracture</p> <p>Excluded: dementia, inability to rate pain</p> <p>Type of fracture: extracapsular fracture of the femoral neck</p> <p>Anaesthetic technique for surgery: not stated</p> <p>Surgical technique: internal fixation of fracture with a dynamic hip screw</p> <p>Mean age: 77 years (range 68 to 89)</p> <p>Percentage female: 70%</p> <p>Length of follow-up: in-hospital</p>
Interventions	<p>Intervention: femoral nerve block (N = 25)</p> <p>Comparator: no nerve block (N = 25)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Pneumonia. 3. Mortality. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Rescue analgesia. 2. Wound infection. 3. Urinary tract infection. 4. Deep venous thrombosis. 5. Cardiovascular complications.

Haddad 1995 (Continued)

6. Pressure sores.

Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>No email address</p> <p>Sources obtained for risk of bias assessment.</p> <p>1. Journal article with results of the trial.</p>
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Henderson 2008
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee</p> <p>Site: Beth Israel Medical Center, New York, NY, USA</p> <p>Data collection: no information</p> <p>Funding: departmental/institutional</p> <p>Registration: no information</p>
Participants	<p>14 participants older than 55 years of age presenting with acute hip fracture</p> <p>Excluded: no information</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: not mentioned</p> <p>Surgical technique: no information</p> <p>Median age: 78 years (range not stated)</p> <p>Percentage female: 64%</p> <p>Length of follow-up: 24 hours or until surgery</p>
Interventions	<p>Intervention: femoral nerve block (N = 6)</p> <p>Comparator: no nerve block (N = 8)</p>
Outcomes	<p>Relevant to this review.</p> <p>1. Pain.</p> <p>2. Opioid consumption.</p> <p>3. Complications.</p> <p>Not relevant to this review.</p> <p>1. Rescue analgesia.</p>
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>Conference abstract; reported as preliminary results of a larger trial</p>

Henderson 2008 (Continued)

No email address

Sources obtained for risk of bias assessment.

1. Conference abstract about the trial.

Hogg 2009
Study characteristics

Methods	<p>Parallel RCT</p> <p>Ethics committee approval and participant consents: not stated</p> <p>Site: Belfast, UK</p> <p>Data collection: no information</p> <p>Funding: no information</p> <p>Registration: ISRCTN07083722</p>
Participants	<p>39 participants undergoing surgery for femoral neck fracture</p> <p>Excluded: no information</p> <p>Type of fracture: femoral neck fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: no information</p> <p>Mean age: 78 years (range not mentioned)</p> <p>Percentage female: no information</p> <p>Length of follow-up: 15 minutes</p>
Interventions	<p>Intervention: fascia iliaca block (N = 19)</p> <p>Comparator: no nerve block (N = 20)</p> <p>All participants had a block at the end of surgery (part 2 of the study); therefore, for the present review, we retained only part 1 of the study (i.e. pain scores during positioning for spinal block)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Rescue sedation for positioning for spinal block.
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>Conference abstract</p> <p>No email address</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Non-commercial trial registry record.

Hogg 2009 (Continued)

2. Conference abstract about the trial.

Hood 1991
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and written informed consents obtained</p> <p>Site: Sheffield, UK</p> <p>Data collection: no information</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>50 participants > 60 years of age with hip fracture surgically treated with a pin and plate or a compression screw</p> <p>Excluded: absolute contraindication to a regional technique, allergy to local anaesthetic agents, systemic disease that indicated an alternative method of anaesthesia</p> <p>Type of fracture: intertrochanteric fracture of the neck of the femur</p> <p>Anaesthetic technique for surgery: general anaesthesia</p> <p>Surgical technique: compression screw or pin and plate device</p> <p>Mean age: 81 years (range 62 to 94)</p> <p>Percentage female: 88%</p> <p>Length of follow-up: 24 hours</p>
Interventions	<p>Intervention: femoral (triple nerve block) nerve block and infiltration above the iliac crest (N = 25)</p> <p>Comparator: no nerve block (N = 25)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioids. 2. Mortality. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Haemodynamic variables. 2. Time to awakening from general anaesthesia. 3. Number of participants requiring rescue analgesia. 4. Quality of analgesia (recovery and ward staff). 5. Prilocaine plasmatic concentrations.
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>No email address</p> <p>Sources obtained for risk of bias assessment.</p>

Hood 1991 (Continued)

1. Journal article with results of the trial.

Jadon 2014
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Tata Motors Hospital, Jamshedpur, Jharkhand, India</p> <p>Data collection: no information</p> <p>Funding: departmental/institutional</p> <p>Registration: no information</p>
Participants	<p>60 ASA I to II participants of both sexes, weight > 50 kg, scheduled for fracture femur operation under central neuraxial block but unable to sit because of pain</p> <p>Excluded: could sit comfortably; any contraindication to spinal anaesthesia, FNB, or local anaesthetic</p> <p>Type of fracture: neck femur fracture (N = 16), intertrochanteric femur fracture (N = 29), shaft femur fracture (N = 15)</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: not stated</p> <p>Mean age: 64.3 years (range 18 to 70 years)</p> <p>Percentage female: 33%</p> <p>Length of follow-up: 5 minutes</p>
Interventions	<p>Intervention: femoral nerve block (N = 23 for proximal end femur fracture)</p> <p>Comparator: no nerve block (N = 21 for proximal end femur fracture)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain (at 5 minutes after block placement). 2. Participant satisfaction (binary scale). <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Haemodynamic variables. 2. Pulse oximetry during spinal blockade. 3. Time to perform spinal block. 4. Quality of positioning. 5. Rescue analgesia.
Notes	<p>Conflict of interest: "none declared"</p> <p>DOI: 10.4103/0019-5049.147146</p> <p>Study also includes participants with shaft fracture. We obtained results for pain scores on movement for participants with proximal fracture only from the study authors. However, we did not keep results in the analysis (see Effects of interventions) owing to the short delay between the block and the evaluation</p>

Jadon 2014 (Continued)

Email sent on 5 January 2020 for additional information

Sources obtained for risk of bias assessment.

1. Journal article with results of the trial.
2. Personal communication with trialist.

Jang 2018
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Hallym University, Chuncheon Sacred Heart Hospital, Department of Anesthesiology, Chuncheon, Korea</p> <p>Data collection: no information</p> <p>Funding: governmental</p> <p>Registration: KCT0001702</p>
Participants	<p>32 participants 60 years of age or older, radiographically proven and isolated femoral neck fracture, normal distal neurovascular status, moderate to severe (≥ 5) verbal/visual analogue scale pain score</p> <p>Excluded: refused to participate or with known history of study drug allergy, previous femoral vascular surgery on same side of the fracture, inability to understand the study protocol</p> <p>Type of fracture: femoral neck fracture</p> <p>Anaesthetic technique for surgery: not mentioned</p> <p>Surgical technique: not mentioned</p> <p>Mean age: 75.6 years (range 61 to 90)</p> <p>Percentage female: 70%</p> <p>Length of follow-up: 48 hours</p>
Interventions	<p>Intervention: femoral nerve block (N = 16)</p> <p>Comparator: sham block with saline (N = 16)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain (all measurements before surgery). 2. Opioid (before surgery). <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Inflammation. 2. Opioid side effects. 3. Desaturation.
Notes	<p>Conflict of interest: none</p> <p>DOI: 10.1016/j.bjan.2018.03.004</p> <p>Email sent on 5 January 2020</p>

Jang 2018 (Continued)

Sources obtained for risk of bias assessment.

1. Journal article with results of the trial.

Jones 1985
Study characteristics

Methods	<p>Parallel RCT</p> <p>Informed consents obtained</p> <p>Site: Royal Free Hospital, Pond Street, Hampstead, London, UK</p> <p>Data collection: not mentioned</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>19 participants with an extracapsular hip fracture treated with a pin and plate or a sliding hip screw</p> <p>Excluded: other painful lesions, signs of moderate or severe dementia, < 65 years of age, systemic disease indicating an alternative method of anaesthesia (e.g. spinal)</p> <p>Type of fracture: extracapsular hip fracture</p> <p>Anaesthetic technique for surgery: general anaesthesia</p> <p>Surgical technique: pin and plate or a sliding hip screw</p> <p>Mean age: 82 years (range 67 to 93)</p> <p>Percentage female: 95%</p> <p>Length of follow-up: 24 hours</p>
Interventions	<p>Intervention: lateral femoral cutaneous nerve block (N = 10)</p> <p>Comparator: no nerve block (N = 9)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none">1. Opioids.2. Mortality. <p>Not relevant to this review.</p> <ol style="list-style-type: none">1. Duration of analgesia.
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>No email address</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none">1. Journal article with results of the trial.

Kullenberg 2004

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Ortopedkliniken, Blekingesjukhuset, Karlshamn, Sweden</p> <p>Data collection: no information</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>80 participants with hip fracture confirmed by X-ray</p> <p>Excluded: inability to rate pain</p> <p>Type of fracture: femoral neck (66%) or trochanteric (44%) fracture</p> <p>Anaesthetic technique for surgery: not stated</p> <p>Surgical technique: nail-osteosynthesis (Garden 1 to 2 fractures) or hemi-endoprosthesis (Garden 3 to 4 fractures)</p> <p>Mean age: 82 years (range not stated)</p> <p>Percentage female: 64%</p> <p>Length of follow-up: in-hospital (mean 11 days)</p>
Interventions	<p>Intervention: femoral nerve block (N = 40)</p> <p>Comparator: no nerve block (N = 40)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Time to first mobilization. 4. Opioids used. 5. Pressure sores. 6. Participant satisfaction (all participants indicated that they would consider a new future blockade if this would be necessary). <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Hospital length of stay. 2. Block duration.
Notes	<p>Conflict of interest: "no conflict of interest declared"</p> <p>DOI: n/a</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial.

Landsting 2008

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained. "Patients who were unable to give their consent were included following presumed consent; they were assessed as not having the capacity for consent at the time of inclusion. This assessment was made by the including physician, together with the nurse responsible for the patient. The Short Portable Mental Status Questionnaire was used to support the decision of inclusion on presumed consent. Presumed consent was given with the support of the Regional Ethics Board in Uppsala, as directed by Swedish law".</p> <p>Site: University Hospital, Örebro University, Sweden</p> <p>Data collection: October 2010 to February 2012</p> <p>Funding: governmental (external monitoring)</p> <p>Registration: EudraCT number 2008-004303-59</p>
Participants	<p>127 participants > 64 years of age with radiographically confirmed hip fracture and fascia iliaca compartment block administered within 1 hour of admission to hospital</p> <p>Excluded: refusal to participate, more than 1 fracture, trauma longer than 12 hours before inclusion, hypersensitivity to local anaesthetics, infection in the injection area, neurovascular problems in the affected leg, unable to receive fascia iliaca compartment block within the inclusion time frame, assessed as at risk for complications from fascia iliaca compartment block due to health status</p> <p>Type of fracture: neck (48.8%), trochanteric (45.7%), subtrochanteric (5.5%)</p> <p>Anaesthetic technique for surgery: not stated</p> <p>Surgical technique: no information</p> <p>Mean age: 84.7 years (range 65 to 99)</p> <p>Percentage female: 69.3%</p> <p>Length of follow-up: in-hospital (mean 11 days)</p>
Interventions	<p>Intervention: fascia iliaca compartment block (N = 66)</p> <p>Comparator: sham block with saline (N = 61)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Opioid consumption. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Hospital length of stay. 2. Cognition status.
Notes	<p>Conflict of interest: "the authors declare that they have no competing interests"</p> <p>DOI: 10.1016/j.ijotn.2018.11.003</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Non-commercial trial registry record.

Landsting 2008 (Continued)

3. Personal communication with trialist.

Liebmann 2012

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and written informed consents obtained</p> <p>Site: University Hospital, Rhode Island Hospital, USA</p> <p>Data collection: January 2009 through June 2010</p> <p>Funding: charity</p> <p>Registration: NCT01701414</p>
Participants	<p>36 participants: ≥ 55 years of age, with radiographically proven femoral neck or intertrochanteric fracture, normal lower extremity neurovascular examination, ability to consent and actively participate in the study, moderate to severe pain (numerical pain rating score 5) at time of enrolment</p> <p>Excluded: patients with known international normalized ratio > 3.0, prior femoral artery vascular surgery on the same side as the fracture, other significant trauma, hypoxia (pulse oximetry $< 92\%$), hypotension (systolic blood pressure < 100 mmHg), known hypersensitivity to local anaesthetics or morphine</p> <p>Type of fracture: femoral neck or intertrochanteric fracture</p> <p>Anaesthetic technique for surgery: not mentioned</p> <p>Surgical technique: not mentioned</p> <p>Mean age: 82 years (range 64 to 98)</p> <p>Percentage female: 67%</p> <p>Length of follow-up: time in the emergency department (median durations 480 and 510 minutes)</p>
Interventions	<p>Intervention: femoral nerve block (N = 18)</p> <p>Comparator: sham block (N = 18)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Opioids. 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Haemodynamic variables. 2. Number of participants with rescue analgesia. 3. Opioid side effects. 4. Emergency department length of stay.
Notes	<p>Conflict of interest: no conflict of interest</p> <p>DOI: 10.1111/acem.12154</p> <p>Email sent on 5 January 2020</p>

Liebmann 2012 (Continued)

Sources obtained for risk of bias assessment.

1. Journal article with results of the trial.
2. Non-commercial trial registry record.
3. Personal communication with trialist.

Luger 2012
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and written informed consents obtained</p> <p>Site: Innsbruck Medical University, Innsbruck, Austria</p> <p>Data collection: no information</p> <p>Funding: "the manuscript was solely supported by institutional and private resources"</p> <p>Registration: no information</p>
Participants	<p>34 ASA I to III very elderly participants (> 80 years) with hip fracture (of whom 3 with dementia had to be excluded) scheduled for surgery under spinal anaesthesia</p> <p>Excluded: patients with score < 18 on the Mini-Mental State Examination, whose surgery did not take place within 36 hours, with known intolerance or allergies to drugs, planned or required general anaesthesia, refusal of consent, participation in a different study, administration of midazolam as premedication, chronic pain, contraindications and spinal anaesthesia failure, incomplete data records</p> <p>Type of fracture: pertrochanteric femur fracture (45%) or medial femur neck fracture (55%)</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: hemi-arthroplasty (35%), total hip replacement (10%), dynamic hip screw (30%), cannulated screws (5%) or proximal femoral nail (20%)</p> <p>Mean age: 89 years (range not mentioned)</p> <p>Percentage female: 95%</p> <p>Length of follow-up: in hospital</p>
Interventions	<p>Intervention: continuous femoral (3-in-1) nerve block (N = 10)</p> <p>Comparator: no nerve block (N = 10)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Myocardial ischaemia (number of participants with positive outcome). 3. Opioids. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Cognition. 2. Hospital length of stay.
Notes	<p>Conflict of interest: "the author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article"</p> <p>DOI: 10.1177/2151458512470953</p>

Luger 2012 (Continued)

Study also includes a group with epidural analgesia (N = 14) - not retained in this review

Email sent on 5 January 2020

Ma 2018a
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Xuanwu Hospital of Capital Medical University, Beijing, China</p> <p>Data collection: December 2015 to December 2016</p> <p>Funding: governmental</p> <p>Registration: no information</p>
Participants	<p>116 ASA II to IV participants with hip fracture (femoral neck or intertrochanteric fracture) diagnosed by X-ray</p> <p>Excluded: patients with multiple fractures; allergy to amide local anaesthetic, paracetamol, tramadol, and pethidine; infection at the puncture site of the fascia iliaca compartment; peripheral neuropathy; renal insufficiency; dementia; waiting time before surgery longer than 5 days; patient refusal to join in the study</p> <p>Type of fracture: femoral neck (30%) or intertrochanteric fractures (70%)</p> <p>Anaesthetic technique for surgery: not mentioned</p> <p>Surgical technique: not mentioned</p> <p>Mean age: 80.5 years (range 65 to 95)</p> <p>Percentage female: 65.5%</p> <p>Length of follow-up: AD surgery</p>
Interventions	<p>Intervention: fascia iliaca compartment block (N = 58)</p> <p>Comparator: no nerve block (N = 58)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Participant satisfaction. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Sedation. 3. Rescue analgesia (number of participants who required it).
Notes	<p>Conflict of interest: no information</p> <p>DOI: 10.3760/cma.j.issn.0376-2491.2018.10.002</p> <p>Email sent on 5 January 2020</p>

Madabushi 2016

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: MS Ramaiah Medical College and Hospitals, Bangalore, India</p> <p>Data collection: no information</p> <p>Funding: departmental/institutional</p> <p>Registration: no information</p>
Participants	<p>60 ASA status I to III participants undergoing surgery for all types of femoral neck fractures</p> <p>Excluded: patients with bleeding diathesis and neuropsychiatric complaints, those on previous opioid therapy or with polytrauma</p> <p>Type of fracture: intertrochanteric or neck fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: not mentioned</p> <p>Mean age: 59.6 years (range 25 to 75)</p> <p>Percentage female: 47%</p> <p>Length of follow-up: 24 hours</p>
Interventions	<p>Intervention: fascia iliaca block (N = 30)</p> <p>Comparator: no nerve block (N = 30)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain during positioning for spinal anaesthesia. 2. Opioid requirements (number of participants who required rescue analgesia; not retained for this review). 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Quality of positioning. 2. Haemodynamic variables. 3. Time required for performance of spinal anaesthetic technique
Notes	<p>Conflict of interest: none</p> <p>DOI: 10.1016/j.jclinane.2016.09.014</p> <p>Email sent on 5 January 2020</p>

Morrison 2008

Study characteristics

Methods	Parallel RCT
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Peripheral nerve blocks for hip fractures in adults (Review)

Morrison 2008 (Continued)

Approved by the ethics committee and informed consents obtained

Site: 3 university hospitals: Beth Israel, Icahn School of Medicine at Mount Sinai, and Maimonides Medical Center, New York, NY, USA

Data collection: April 2009 to March 2013

Funding: governmental

Registration: NCT00749489

Participants	<p>164 adult patients 60 years of age and over, presenting from 08H00 to 20H00 with a radiographically confirmed hip fracture (femoral neck, intertrochanteric, or pericapsular)</p> <p>Excluded: history of advanced dementia, presence of multiple trauma, pathological fractures, bilateral hip fractures, previous fracture or surgery at the currently fractured site, transferred from another hospital, with cirrhosis or liver failure, had a delay between fracture and admission > 48 hours, were delirious according to the Confusion Assessment</p> <p>Type of fracture: femoral neck (40.5%) or femoral intertrochanteric fracture</p> <p>Anaesthetic technique for surgery: regional (62.1%) or general anaesthesia</p> <p>Surgical technique: hemi-arthroplasty (29%) or internal fixation</p> <p>Mean age: 82.5 years (range 60 to 98)</p> <p>Percentage female: 72.6%</p> <p>Length of follow-up: 6 weeks</p>
Interventions	<p>Intervention: femoral nerve block followed by a continuous fascia iliaca block (N = 72)</p> <p>Comparator: no nerve block (N = 81)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Mortality. 3. Acute confusional state. 4. Opioid consumption. 5. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Distance walked on postoperative day 3. 2. Walking ability 6 weeks after discharge. 3. Opioid side effects. 4. Hospital length of stay. 5. In-hospital falls.
Notes	<p>Conflict of interest: "the editor-in-chief has reviewed the conflict of interest checklist provided by the authors and has determined that the authors have no financial or any other kind of personal conflicts with this paper. Dr. Silverstein died before the study's completion. At the time of his death, he reported no conflicts of interest"</p> <p>DOI: 10.1111/jgs.14386</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal articles with results of the trial. 2. Non-commercial trial registry record.

Morrison 2008 (Continued)

3. Conference abstracts about the trial.

Mosaffa 2005
Study characteristics

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: Akhtar Hospital, Iran Data collection: not stated Funding: not stated Registration: not stated
Participants	40 participants with femoral neck fracture Excluded: not stated Type of fracture: femoral neck fracture Anaesthetic technique for surgery: spinal block Surgical technique: not stated Mean age: not stated (no information on range) Percentage female: not stated Length of follow-up: not stated
Interventions	Intervention: fascia iliaca compartment block (N = 20) Comparator: no nerve block (N = 20)
Outcomes	Relevant to this review. 1. Pain. 2. Participant satisfaction. Not relevant to this review. 1. Quality of positioning for spinal anaesthesia.
Notes	Conflict of interest: no information DOI: n/a Conference abstracts Email sent on 26 May 2015; no reply

Mouzopoulos 2009
Study characteristics

Methods	Parallel RCT
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Peripheral nerve blocks for hip fractures in adults (Review)

Mouzopoulos 2009 (Continued)

Approved by the ethics committee and signed informed consents obtained

Site: University of Athens, Athens, Greece

Data collection: July 2004 until March 2008

Funding: not stated

Registration: not stated

Participants	<p>207 participants aged ≥ 70 years at intermediate or high risk of delirium scheduled for hip fracture repair</p> <p>Risk classification was based on the presence of 4 predictive risk factors (severity of illness, measured by acute physiology, age, and long-term health examination; cognitive impairment, measured by the mini-mental state examination score; index of dehydration, measured by the ratio of blood urea nitrogen to creatinine; and visual impairment, measured by the standardized Snellen test) as described by Inouye. Intermediate risk for postoperative delirium was defined as the presence of 1 or 2 risk factors; high risk was defined as the presence of ≥ 3 risk factors</p> <p>Excluded: delirium at admission, metastatic hip cancer, history of bupivacaine allergy, use of cholinesterase inhibitors, severe coagulopathy, parkinsonism, epilepsy, levodopa treatment, surgery delayed longer than 72 hours after admission, inability to participate in interviews (profound dementia, respiratory isolation, intubation, aphasia, coma, or terminal illness)</p> <p>Type of fracture: intertrochanteric (71.5%) or subcapital fracture</p> <p>Anaesthetic technique for surgery: epidural anaesthesia</p> <p>Surgical technique: subcapital and trochanteric hip fractures were treated with hemi-arthroplasty (29.5%) and intramedullary nailing, respectively</p> <p>Mean age: 72.7 years (range not stated) Percentage female: 74.4% Length of follow-up: in-hospital</p>
Interventions	<p>Intervention: repeated fascia iliaca compartment block (N = 108)</p> <p>Comparator: sham block (N = 111)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state (reduction was seen only in participants at intermediate risk of developing delirium - not among those at high risk). 3. Mortality. 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Cognitive function.
Notes	<p>Conflict of interest: "the authors declare that they have no conflict of interest related to the publication of this manuscript"</p> <p>DOI: 10.1007/s10195-009-0062-6</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial.

Murgue 2006

Study characteristics

Methods	Parallel RCT Informed consents obtained Site: Feurs, France Data collection: 1 January 2003 to 1 January 2004 Funding: no information Registration: no information
Participants	45 participants with hip fracture Excluded: inability to rate their pain (evaluated with a Mini Mental score), contraindication to nitrous oxide, regional anaesthesia, allergy to study drugs, severe respiratory disease, thoracic trauma, renal dysfunction, pre-fracture opioid treatment Type of fracture: neck femoral fracture Anaesthetic technique for surgery: no information Surgical technique: no information Mean age: 86 years (range 70 to 96) Percentage female: 82% Length of follow-up: AD skin traction placement before surgery
Interventions	Intervention: femoral nerve block (N = 16) Comparator: no nerve block (N = 29); IV morphine (N = 14), or IV paracetamol and ketoprofen (N = 15) We retained only the IV morphine group as the comparator
Outcomes	Relevant to this review. 1. Pain. Not relevant to this review. 1. Maximal angle during passive elevation of fractured limb to elicit pain.
Notes	Conflict of interest: no information DOI: n/a Invalid email address Sources obtained for risk of bias assessment. 1. Journal article with results of the trial.

Nie 2015

Study characteristics

Methods	Parallel RCT
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Peripheral nerve blocks for hip fractures in adults (Review)

Nie 2015 (Continued)

	<p>Approved by the ethics committee and written informed obtained</p> <p>Site: The 4th People's Hospital of Guiyang, Guiyang, China</p> <p>Data collection: December 2012 to December 2013</p> <p>Funding: governmental</p> <p>Registration: "the trial was not registered with a trial registry"</p>
Participants	<p>104 participants scheduled for open reduction of hip fracture</p> <p>Excluded: neuropathy involving lower extremities, bladder dysfunction, coagulopathies, known allergy to amide local anaesthetic drugs or opioids, inability to co-operate, psychological disorder, linguistic difficulty that could interfere with pain assessment</p> <p>Type of fracture: proximal femoral fracture</p> <p>Anaesthetic technique for surgery: general anaesthesia</p> <p>Surgical technique: open reduction and internal fixation using the anti-rotation proximal femoral nail technique</p> <p>Mean age: 70.8 years (range not stated)</p> <p>Percentage female: no information</p> <p>Length of follow-up: in-hospital (mean 22 days)</p>
Interventions	<p>Intervention: continuous fascia iliaca compartment block (N = 51)</p> <p>Comparator: no nerve block (N = 53)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Opioid consumption. 4. Participant satisfaction. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Blood loss.
Notes	<p>Conflict of interest: "the authors have no conflicts of interest to declare"</p> <p>DOI: n/a</p> <p>Additional information received from study authors</p> <p>Email sent on 5 January 2020 for additional information</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Personal communication with trialist.

Ranjit 2016

Study characteristics

Ranjit 2016 (Continued)

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Dhulikhel Hospital, Kathmandu University Hospital Dhulikhel, Kavre, Nepal</p> <p>Data collection: January 2015 to December 2015</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>40 ASA I or II participants undergoing surgery for proximal femur fracture</p> <p>Excluded: bleeding diathesis, known adverse reaction to amide local anaesthetics, polytrauma, inability to assign pain score for any reason, use of analgesics 6 hours before surgery</p> <p>Type of fracture: proximal femur fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: closed reduction fixation for proximal femur fracture</p> <p>Mean age: 61.7 years (range 18 to 75)</p> <p>Percentage female: 37.5%</p> <p>Length of follow-up: intraoperative</p>
Interventions	<p>Intervention: femoral nerve block (N = 20)</p> <p>Comparator: no nerve block and intravenous fentanyl (N = 20)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain during positioning for spinal anaesthesia. 2. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Quality of positioning. 2. Rescue analgesia. 3. Time required to perform spinal block. 4. Haemodynamic variables.
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial.

Segado Jimenez 2009

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p>
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Peripheral nerve blocks for hip fractures in adults (Review)

Segado Jimenez 2009 (Continued)

Site: Complejo Hospitalario de Ourense, Spain

Data collection: May to December 2008

Funding: no information

Registration: no information

Participants	<p>75 participants undergoing hip fracture repair under spinal anaesthesia</p> <p>Excluded: general anaesthesia or intravenous administration of analgesics intraoperatively; pretreatment for chronic pain or for ischaemic heart rhythm disorder; neurodegenerative or psychiatric disease; lack of collaboration and/or understanding of the participant; allergy to local anaesthetics; contraindications for regional anaesthesia</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: total (50.7%) or partial (26.7%) arthroplasty or femur osteosynthesis (gamma nail insertion (14.7%) or clove Richards insertion (8%))</p> <p>Mean age: 72 years (range 47 to 96)</p> <p>Percentage female: 56%</p> <p>Length of follow-up: in-hospital</p>
Interventions	<p>Intervention 1: lateral femoral cutaneous nerve block and obturator nerve block (N = 25)</p> <p>Intervention 2: obturator nerve block only (N = 25)</p> <p>Comparator: no nerve block (N = 25)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Time to first mobilization after surgery. 3. Costs. 4. Opioids. 5. Participant satisfaction (ascending scale from 1 to 5). 6. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Duration of analgesia. 2. Rescue analgesia. 3. Opioid side effects. 4. Haemodynamic variables.
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Personal communication with trialist.

Spansberg 1996

Study characteristics

Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: University Hospital of Aarhus, Denmark Data collection: not stated Funding: no information Registration: no information
Participants	20 participants with hip fracture surgically treated Excluded: no information Type of fracture: femoral neck fracture Anaesthetic technique for surgery: spinal block Surgical technique: no information Mean age: 81 years (range 58 to 91) Percentage female: unclear Length of follow-up: in-hospital
Interventions	Intervention: continuous femoral nerve block (N = 10) Comparator: sham block (N = 10)
Outcomes	Relevant to this review. <ol style="list-style-type: none"> Pain. Opioids. Complications. Not relevant to this review. <ol style="list-style-type: none"> Opioid side effects. Urinary retention.
Notes	Conflict of interest: no information DOI: n/a No email address Sources obtained for risk of bias assessment. <ol style="list-style-type: none"> Journal article with results of the trial.

Szucs 2010

Study characteristics

Methods	Parallel RCT Approved by the ethics committee and written informed consents obtained
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Szucs 2010 (Continued)

	<p>Site: University Hospital, Wilton, Cork, Ireland</p> <p>Data collection: no information</p> <p>Funding: departmental/institutional</p> <p>Registration: not registered</p>
Participants	<p>24 ASA I to III participants aged > 50 years presenting with fractured neck of femur</p> <p>Excluded: patients who refused or had more than 1 fracture; Mini-Mental Score < 22; coagulation disorder; head injury; loss of consciousness; 10 mg or more morphine administered pre-hospital; acute intercurrent heart disease; allergy to bupivacaine, morphine, or paracetamol; skin lesion/infection at block site; renal dysfunction; evidence of systemic infection (clinically defined or elevated C-reactive protein levels, leucocytosis, or body temperature > 37.8 °C)</p> <p>Type of fracture: neck of femur fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: no information</p> <p>Mean age: 78.1 years (range not stated)</p> <p>Percentage female: 67%</p> <p>Length of follow-up: 72 hours after surgery</p>
Interventions	<p>Intervention: continuous femoral nerve block (N = 12)</p> <p>Comparator: no nerve block (N = 12)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Opioid consumption. 3. Participant satisfaction. 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Functional outcome.
Notes	<p>Conflict of interest: "the authors declare that they have no competing interests"</p> <p>DOI: 10.1186/2047-0525-1-4</p> <p>Email sent on 5 January 2020: additional information received from study authors</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Conference abstract about the trial. 3. Personal communication with trialist.

Thompson 2019
Study characteristics

Methods	Parallel RCT
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Thompson 2019 (Continued)

	<p>Approved by the ethics committee and informed consents obtained</p> <p>Site: University Hospital, East Meadow, NY, USA</p> <p>Data collection: February 2017 to February 2019</p> <p>Funding: departmental/institutional</p> <p>Registration: no information</p>
Participants	<p>47 participants ≥ 60 years of age diagnosed with acute fracture of the femoral neck, intertrochanteric or subtrochanteric region of the femur</p> <p>Excluded: dementia, periprosthetic or pathological hip fracture, incarcerated patient, history of complex regional pain syndrome, history of opioid abuse, current opioid use, chronic pain</p> <p>Type of fracture: femoral neck (25.5%), intertrochanteric (66%), or subtrochanteric (8.5%)</p> <p>Anaesthetic technique for surgery: spinal block or general anaesthesia</p> <p>Surgical technique: cephalomedullary nail ($\cong 70\%$), closed reduction percutaneous pinning ($\cong 2\%$), dynamic hip screw ($\cong 6\%$), hemi-arthroplasty ($\cong 19\%$), or total hip arthroplasty ($\cong 2\%$)</p> <p>Mean age: not stated (range not stated)</p> <p>Percentage female: 70%</p> <p>Length of follow-up: 72 hours after surgery</p>
Interventions	<p>Intervention: fascia iliaca compartment block (N = 23)</p> <p>Comparator: no nerve block (N = 24)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Opioid consumption. 3. Participant satisfaction. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Functional recovery.
Notes	<p>Conflict of interest: "the authors report no conflicts of interest related to this work"</p> <p>DOI: 10.1097/BOT.0000000000001634</p> <p>Invalid email address</p>

Tuncer 2003
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Konya, Turkey</p> <p>Funding: no information</p> <p>Registration: no information</p>
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Tuncer 2003 (Continued)

Participants	<p>40 ASA I to II participants with hip fracture, undergoing surgery for trochanteric hip fracture</p> <p>Excluded: coagulation abnormality, age < 18 or > 80 years, weight < 50 or > 100 kg, known allergy to bupivacaine or opioids, previous analgesic treatment with opioids, inability to understand pain scales or use a patient-controlled analgesia device</p> <p>Type of fracture: trochanteric femur fracture</p> <p>Anaesthetic technique for surgery: general anaesthesia</p> <p>Surgical technique: trochanteric fracture repair</p> <p>Mean age: 59 years (range not stated)</p> <p>Percentage female: not stated</p> <p>Length of follow-up: in-hospital</p>
Interventions	<p>Intervention: continuous femoral (3-in-1) nerve block (N = 20)</p> <p>Comparator: no nerve block (N = 20)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Participant satisfaction (ascending scale from 1 to 4). <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Time to first walk. <p>Participant satisfaction (rated as excellent, good, moderate, or poor; we assigned scores from 1 to 4 to compare data)</p>
Notes	<p>Conflict of interest: no information</p> <p>DOI: 10.1016/S1366-0071(03)00004-4</p> <p>Email sent to study authors on 24 May 2015, to ask for additional information; no reply</p>

Unneby 2017
Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Umeå University, Umeå, Sweden</p> <p>Data collection: between April 2009 and September 2011</p> <p>Funding: charity</p> <p>Registration: no information</p>
Participants	<p>266 participants aged ≥ 70 years with hip fracture (trochanteric and cervical), including those with dementia (N = 120)</p> <p>Excluded: infection or previous vascular surgery in the inguinal area</p> <p>Type of fracture: trochanteric (48.1%) or neck (51.9%) femur fracture</p>

Peripheral nerve blocks for hip fractures in adults (Review)

Unneby 2017 (Continued)

	<p>Anaesthetic technique for surgery: no information</p> <p>Surgical technique: no information</p> <p>Mean age: 84.1 years (range not stated)</p> <p>Percentage female: 64%</p> <p>Length of follow-up: 18 hours</p>
Interventions	<p>Intervention: femoral nerve block (N = 129)</p> <p>Comparator: no nerve block (N = 137)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Opioid requirements. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. None.
Notes	<p>Conflict of interest: none</p> <p>DOI: 10.1016/j.injury.2017.04.043</p> <p>Email sent on 5 January 2020</p>

Uysal 2018

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Mugla Sitki Koçman University Training and Research Hospital, Isparta, Turkey</p> <p>Data collection: 15 April 2018 to 18 May 2018</p> <p>Funding: departmental/institutional</p> <p>Registration: ACTRN12618000546257</p>
Participants	<p>110 ASA II to IV participants > 65 years of age with hip fracture</p> <p>Excluded: preexisting delirium at admission to emergency service, femur fracture due to metastatic carcinoma, bupivacaine allergy, cholinesterase inhibitor or levodopa medication, parkinsonism or epilepsy, contraindication for nerve blockage. Patients operated longer than 48 hours after admission were excluded from the trial</p> <p>Type of fracture: trochanteric femur fracture</p> <p>Anaesthetic technique for surgery: combined spinal/epidural; both groups had postoperative epidural analgesia</p> <p>Surgical technique: no information</p> <p>Mean age: 81.7 years (range not stated)</p> <p>Percentage female: 44%</p> <p>Length of follow-up: 3 days</p>
Interventions	<p>Intervention: continuous femoral nerve block (N = 46)</p> <p>Comparator: no nerve block and IV paracetamol (N = 45)</p>
Outcomes	<p>Relevant to this review.</p>

Uysal 2018 (Continued)

1. Pain (postoperative pain scores not retained because both groups had postoperative epidural analgesia).
2. Acute confusional state.
3. Mortality (not retained for this review because all participants received epidural analgesia after surgery).

Not relevant to this review.

1. Inflammation (including CSF measurements sampled during spinal blockade).
2. Rescue analgesia.

Notes	<p>Conflict of interest: "none declared"</p> <p>DOI: 10.14744/tjtes.2019.78002</p> <p>Email sent to authors 23 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Non-commercial trial registry record.
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Wang 2015

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: University Hospital, Beijing, China</p> <p>Data collection: October 2015 to December 2016</p> <p>Funding: departmental/institutional and governmental</p> <p>Registration: ChiCTR-IPR-15007283</p>
Participants	<p>88 ASA classification III or IV, very elderly (age ≥ 80 years) participants with hip fracture, complicated by at least 1 cardiovascular, neurological, or pulmonary disease</p> <p>Excluded: more than 1 fracture; allergy to amide local anaesthetics, paracetamol, or tramadol; infection at the puncture site; peripheral neuropathy; contraindication to spinal block; renal insufficiency; dementia; preoperative waiting time ≥ 5 days</p> <p>Type of fracture: femoral neck or intertrochanteric femur fracture</p> <p>Anaesthetic technique for surgery: combined spinal/epidural</p> <p>Surgical technique: proximal femoral nail anti-rotation (76.1%), hemi-arthroplasty (17.1%), cannulated screws (3.4%), or total hip replacement (3.4%)</p> <p>Mean age: 83.9 years (range ≥ 80 years)</p> <p>Percentage female: 65%</p> <p>Length of follow-up: in-hospital (mean 10 and 14 days)</p>
Interventions	<p>Intervention: continuous fascia iliaca block (N = 44)</p> <p>Comparator: sham block with saline (N = 44)</p>
Outcomes	<p>Relevant to this review.</p>

Wang 2015 (Continued)

1. Pain.
2. Myocardial infarction.
3. Pneumonia.
4. Mortality.
5. Costs.
6. Myocardial ischaemia.
7. Participant satisfaction.
8. Complications.

Not relevant to this review.

1. Analgesia-associated side effects.
2. Cerebral complications.
3. Length of hospital stay.
4. Hospital costs.
5. Blood loss.

Notes

Conflict of interest: none

DOI: 10.3892/etm.2018.6417

Email sent on 5 January 2020

Sources obtained for risk of bias assessment.

1. Journal article with results of the trial.
2. Non-commercial trial registry record.

White 1980
Study characteristics
Methods

Parallel RCT

Consents obtained

Site: Groote Schuur Hospital, Observatory, Cape Town, South Africa

Data collection: not mentioned

Funding: no information

Registration: no information

Participants

60 participants with hip fracture undergoing surgery

Excluded: fracture sustained longer than 8 days before admission; < 60 years old; absolute contraindication to a regional technique, such as localized sepsis, suspicion of bacteraemic process, or anticoagulant therapy; overt or suspected endocrine disorder other than diabetes mellitus

Type of fracture: neck of femur fracture

Anaesthetic technique for surgery: general anaesthesia

Surgical technique: Austin Moore prosthesis or a Zimmer sliding screw

Mean age: 79 years (range not stated)

Percentage female: 81%

White 1980 (Continued)

Length of follow-up: 4 weeks

Interventions	<p>Intervention: psoas compartment block (N = 20)</p> <p>Comparator 1: no nerve block (N = 20)</p> <p>Comparator 2: spinal (N = 20), not retained for this review</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Confusion. 2. Pneumonia. 3. Mortality. 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Blood gases. 2. Haemodynamic variables. 3. Hospital length of stay. 4. Opioid side effects. 5. Deep venous thrombosis.
Notes	<p>Conflict of interest: no information</p> <p>DOI: n/a</p> <p>No email address</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial.

Yamamoto 2016

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Shimane University Faculty of Medicine, Shimane, Japan</p> <p>Data collection: October 2016 to January 2018</p> <p>Funding: departmental/institutional</p> <p>Registration: JPRN-UMIN0 0 0 024147</p>
Participants	<p>53 ASA I or II participants over 50 years of age with acute proximal hip fracture</p> <p>Excluded: poorly controlled diabetes mellitus, defined as haemoglobin A1c level > 7.0%; neurological disease; history of allergy to study drugs; serious systemic comorbidity; bleeding disorder; previous surgery in affected hip; regular opioid therapy; infection at injection site; open fracture; multiple injuries requiring pain medications or other surgeries; impaired cognition or dementia; delirium at admission</p> <p>Type of fracture: femoral neck (39.6%) or pertrochanteric (60.4%) femur fracture</p> <p>Anaesthetic technique for surgery: spinal block</p>

Peripheral nerve blocks for hip fractures in adults (Review)

Yamamoto 2016 (Continued)

Surgical technique: internal fixation (84.9%) or bipolar hemi-arthroplasty (15.1%)

Mean age: 84.6 (range not stated)

Percentage female: 84.9%

Length of follow-up: 7 days

Interventions	<p>Intervention: fascia iliaca compartment block (N = 25)</p> <p>Comparator: no nerve block (N = 28)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Time to first mobilization after surgery. 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Rescue analgesia.
Notes	<p>Conflict of interest: "there are no conflicts of interest to declare"</p> <p>DOI: 10.1016/j.injury.2019.03.008</p> <p>Email sent on 5 January 2020</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Non-commercial trial registry record.

Yang 2016

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: West China Hospital, Sichuan University, Sichuan, China</p> <p>Data collection: not mentioned</p> <p>Funding: no information</p> <p>Registration: no information</p>
Participants	<p>32 ASA II to III participants scheduled for hip fracture surgery</p> <p>Excluded: no information</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: general anaesthesia</p> <p>Surgical technique: hip fracture surgery</p> <p>Mean age: not mentioned (range 66 to 90)</p> <p>Percentage female: no information</p>

Yang 2016 (Continued)

Length of follow-up: 3 days

Interventions	<p>Intervention: continuous fascia iliaca compartment block (N not clearly mentioned, taken as 16)</p> <p>Comparator: no nerve block and intravenous patient-controlled analgesia with sufentanil (N not clearly mentioned, taken as 16)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Rescue analgesia.
Notes	<p>Conflict of interest: "none declared"</p> <p>DOI: 10.1213/01.ane.0000492738.72065.76</p> <p>Conference abstract</p> <p>No email address</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Conference abstract about the trial.

Yun 2009

Study characteristics

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and written informed consents obtained</p> <p>Site: University Hospital, College of Medicine, Seoul National University Bundang Hospital, Seongnam, Korea</p> <p>Data collection: July 2007 to December 2007</p> <p>Funding: departmental/institutional</p> <p>Registration: no information</p>
Participants	<p>40 ASA physical status I to III participants with isolated femoral neck fracture</p> <p>Mean age: not mentioned (range 62 to 88)</p> <p>Excluded: known allergy to amide local anaesthetics, haemorrhagic diathesis, peripheral neuropathy, mental disorder</p> <p>Type of fracture: Garden's classification III or IV femoral neck fracture</p> <p>Anaesthetic technique for surgery: spinal block</p> <p>Surgical technique: bipolar hemi-arthroplasty (82.5%), closed reduction and internal fixation with compression hip screw (12.5%), or total hip replacement arthroplasty (5%)</p>

Yun 2009 (Continued)

Mean age: 75 years (range 62 to 88)

Percentage female: 65%

Length of follow-up: 24 hours

Interventions	<p>Intervention: fascia iliaca compartment block (N = 20)</p> <p>Comparator: no nerve block (N = 20)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Opioids. 3. Participant satisfaction (categorical score). 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Cognitive function. 2. Opioid side effects. 3. Haemodynamic variables.
Notes	<p>Conflict of interest: "no conflict of interest"</p> <p>DOI: 10.1111/j.1399-6576.2009.02052.x</p> <p>Email sent on 5 January 2020; additional information received from study authors</p> <p>Sources obtained for risk of bias assessment.</p> <ol style="list-style-type: none"> 1. Journal article with results of the trial. 2. Conference abstract about the trial. 3. Personal communication with trialist.

ASA: American Society of Anesthesiologists physical status.

CSF: cerebrospinal fluid.

DSM: Diagnostic and Statistical Manual of Mental Disorders.

ECG or EKG: electrocardiogram.

ED: emergency department.

FNB: femoral nerve block.

G: gram.

h: hour.

IM: intramuscular.

IQR: interquartile range.

IV: intravenous.

mcg: microgram.

mg: milligram.

mL: millilitre.

N: number

n/a: not available.

PCA: patient-controlled analgesia.

RCT: randomized controlled trial.

SC: subcutaneous.

SD: standard deviation.

VAS or VRS: visual or verbal analogue/response scale.

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Akhtar 2015	Not an RCT: the word 'random' is not mentioned anywhere. The methods section does not suggest any form of randomization: "55 patients with a NOF fracture admitted between August 2014 and January 2015 were recruited. 21 patients were given FIBi and 34 (control) had regular analgesia as per trust guidelines"
Amini 2012	Different intervention: addition or not of dexamethasone to nerve block
Amiri 2012	Different intervention: comparison of combined spinal plus femoral nerve block vs lumbar plexus block
Anaraki 2012	Different population: "the primary aim of our study was to investigate the effects of gabapentin and fascia iliaca block on pain score and morphine consumption after femoral shaft surgery"
Aprato 2018	Different intervention: a comparison of fascia-iliaca compartment block vs intra-articular hip injection for preoperative pain management in intracapsular hip fracture
Arsoy 2017	Not an RCT: "we retrospectively reviewed all geriatric hip fracture patients who were treated surgically from January 11, 2012 to December 31, 2015"
Arsoy 2017a	Not an RCT: "we retrospectively identified 265 consecutive geriatric hip fracture patients who underwent surgical treatment"
Barnes 2019	Not an RCT: "we conducted a prospective case-control study"
Beaudoin 2010	Not an RCT: "this prospective observational study"
Bech 2011	Different intervention: local anaesthetic infiltration
Bendtsen 2014	"Terminated (less inclusions than expected with the given criteria)" Last update posted: 14 September 2015
Bendtsen 2015	"Withdrawn (the study was completely redesigned)" Last update posted: 14 September 2015
Bendtsen 2015a	Different intervention: additional nerve blocks if "verbal pain score (0-10) > 3 at rest or > 5 with passive leg raise 30 minutes after femoral nerve block"
Bendtsen 2015b	Not an RCT: validation of a new block technique that could apply to hip fracture
Bhadani 2017	Different population: "in patients with femoral shaft fracture"
Bhattacharya 2019	Different intervention: comparison between 2 different block techniques (i.e. pericapsular nerve group block and fascia iliaca)
Bouhours 2010	Different intervention: "this study compared the reduction in morphine consumption and related side effects of a continuous femoral block with a single shot block in hip-fracture patients"
Bulger 2015	Different population: 8 participants had no X-ray-proven fracture, 3 had a shaft fracture, and 3 had a fracture of acetabulum, pelvis, or pubic ramus. We were unable to obtain data separately for hip fracture only from study authors
Callear 2016	Not an RCT: "the aim of this project was to evaluate the proportion of patients receiving a fascia-iliac block prior to operative intervention"

Study	Reason for exclusion
Candal-Couto 2005	Not an RCT: "we studied 30 consecutive patients, regardless of their mental state. One hour following the block, there was a significant improvement in the sitting scores as well as the passive hip flexion (mean increase 44 degrees). Visual analogue scores also improved significantly from 7.2 to 4.6 (S.D. 2.4) in the 18 patients without cognitive impairment. We conclude that fascia iliaca blocks can provide significant benefit in the pre-operative period and allow patients to sit up more comfortably while they await surgery"
Carlisle 2004	Different population: this was a randomized trial of 62 participants with femoral trauma who were randomized to receive at the site of the accident a femoral nerve block or intravenous metamizole for pain. Study provided a variety of causes for femoral trauma, including 20 cases of hip fracture. The nerve block was shown to reduce the degree of pain as assessed by the visual analogue scale and to reduce anxiety and heart rate. We excluded the study, as it included participants with other conditions. Trialists were unable to provide separate results for hip fracture participants
Castillon 2017	Not an RCT: "a cohort of 216 patients, from January to December 2016, was studied prospectively"
Chang 2011	Not an RCT: observational trial of patients who were never operated
Christos 2010	Not an RCT: educational article on ultrasound-guided femoral nerve block for hip fracture
Dodd 2019	Different intervention: "objectives: to prove superiority of repeated bolus fascia iliaca catheters compared to single bolus delivered by emergency physicians in emergency hip fractures up to time of surgery"
Dulaney-Cripe 2012	Not an RCT: "all patients who presented to our institution with a hip fracture were given the option of having a continuous fascia iliaca compartment block for pain control versus usual pain management (non-opioids, opioids, and ice therapy)"
Durrani 2013	Different population: 47 proximal fractures, 28 shaft fractures, 9 distal fractures. Mean age 42 years Email sent 17 March 2016, to request separate data for participants with a proximal fracture; no reply
Elkhodair 2011	Not an RCT: "a prospective cohort study was carried out on 137 patients"
Evans 2019	Not an RCT: conference abstract trying to identify patient-prioritized outcomes when evaluating blocks performed by paramedics
Finlayson 1988	Not an RCT: "thirty-six patients with femoral neck fractures attending the accident department over a three month period received femoral blocks from one of the two authors"
Foss 2005	Different intervention: epidural analgesia
Foss 2009	Not an RCT: "one hundred and seventeen hip fracture patients were included in a descriptive prospective study"
Fujihara 2013	Not an RCT: "the included patients were assigned to one of two groups in alternating order"
Gasanova 2019	Different intervention: comparison between different peripheral nerve blocks
George 2016	Different intervention: trial comparing femoral nerve block vs fascia iliaca compartment block
Ghimire 2015	Different intervention: comparison between fascia iliaca block and femoral nerve block for positioning for spinal anaesthesia

Study	Reason for exclusion
Godoy Monzon 2007	Not an RCT: "after informed consent, a physician administered one FICB to 63 sequential adult ED patients (43 women, 20 men; ages 37-96 years, mean 73.5 years) with radiographically diagnosed hip fractures"
Gorodetskyi 2007	Different intervention: this was a randomized study of 60 participants with a trochanteric hip fracture fixed with a sliding hip screw or a trochanteric external fixator. After surgery, participants were randomized to an active non-invasive interactive neurostimulation device or to a sham device. The active device generated biphasic electrical impulses. Participants allocated to the active group had a reduced level of pain, a reduced analgesic requirement, and a greater range of flexion of the injured limb. We excluded the study, as it was not a study of nerve blocks
Gosavi 2001	Not an RCT: all participants had a femoral nerve block
Gozlan 2005	Not an RCT: "étude prospective et descriptive" = prospective and descriptive study
Grigg 2009	Not an RCT: observational report on feasibility of nurses administering a nerve block
Groot 2015	Not an RCT: "between September 2012 and July 2013, we performed a prospective pilot study"
Haines 2012	<p>Not an RCT: "in this prospective, observational, feasibility study", based on published article</p> <p>The trial registry "ClinicalTrials.gov" includes registration NCT01904071 done by one of the study authors (First posted: 22 July 2013; Results first posted: 24 April 2014; Last update posted: 6 June 2018). In the trial registry, one can find results for 3 groups of participants: (1) ultrasound-guided femoral nerve block, (2) ultrasound-guided fascia iliaca block, and (3) no block. Characteristics of participants and results of group ultrasound-guided fascia iliaca published on the website of the trial registry are identical to those published in the observational study, namely, N = 20; age = 82 (SD 7.7) years; female/male = 11/9; and pain score before the procedure = 5.50 (3.99). Furthermore, the trial registry (accessed 27 December 2019) cites the published article summarizing the "observational study" as "Publications of results". For this reason, the study at the trial registry was considered not randomized and was linked to this publication of an observational study</p> <p>The only results available in the trial registry that would have been included in the review are pain at rest 30 minutes after block placement: "1.94 (2.43); 2.05 (2.61); 5.13 (2.70) for ultrasound-guided femoral nerve block, ultrasound-guided fascia iliaca block, and no block, respectively, and absence of serious adverse events"</p>
Hallberg 2012	Terminated
Hao 2018	Different intervention: comparison of ultrasound-guided vs landmark fascia iliaca block; all participants had epidural analgesia for postoperative pain
Hauritz 2009	Not an RCT: all participants had a fascia iliaca block
Helsø 2016	Not an RCT: retrospective trial: "patients were identified from the local database on all hip fracture patients admitted"
Hoffmann 2015	Different intervention: comparison of ultrasound-guided femoral nerve block vs femoral nerve block with no ultrasound for guidance
Hogh 2008	Not an RCT: "the FIB technique has routinely been used pre-operatively in the emergency department since 1 January 2004 for all patients with hip fractures. Over an 8-month period, 187 patients were treated.....Effect of FIB was prospectively assessed on 70 patients"
Hussain 2014	Different intervention: amount of local anaesthetic used (bupivacaine 12.5 mg/kg of body weight) exceeds recommendations

Study	Reason for exclusion
Iamaroon 2010	Different population: although the vast majority of participants had a proximal fracture, 10 participants had a shaft fracture (6 participants for femoral nerve block, 1 for control, or 3 for distal (participants in the control group)). An email was sent on 17 March 2016, to obtain data separately for participants with a proximal fracture; no reply was received
Inan 2009	Different intervention: all participants had a 3-in-1 femoral nerve block with or without the addition of oral dexketoprofen
Irwin 2012	Not an RCT: retrospective study
Isalgue 2014	Not an RCT: although the same number of participants was included in the 2 groups, the word 'random' is not mentioned anywhere in the abstract nor in the text
Ishioka 2018	Not an RCT: "basic design: single arm; randomization: non-randomized"
Kacha 2018	Different population: include patients with acetabular fracture; we were unable to obtain data separately for femur fracture only
Kang 2013	Different intervention: local anaesthetic infiltration
Kassam 2018	Not an RCT: "the first 20 patients (Group A) were treated with traditional analgesia regimen... the second consecutive 20 patients, all underwent a landmark based FIB"
Klukowski 2017	Not an RCT: "a retrospective analysis of perioperative medical records of 78 patients undergoing surgical treatment of proximal femur fractures was performed"
Kristek 2019	Different intervention: "to investigate the possible effect of postoperatively applied analgesics - epidurally applied levobupivacaine or intravenously applied morphine..."
Kumar 2016	Not an RCT: "all 50 patients received an ultrasound guided Fascia Iliaca Compartment Block (FICB)"
Kumie 2015	Not an RCT: single-institution case control study
Lee 2015	Different intervention: in Abstract, "we conducted a prospective cluster trial, randomized by emergency physicians". The trial, published as a conference abstract, reported that peripheral nerve block use was higher for trained emergency physicians compared with (17/21) those without specific training (1/52)
Lee 2016	Different intervention: randomized by emergency physicians: "all participating emergency physicians (EPs) will be randomly assigned to the order they receive training in a stepped wedge design"; "which block that will be used will be randomly determined at the individual patient level"
Leeper 2012	Not an RCT: "analgesia requirements for all patients admitted with fractured neck of femur to one unit over a 9-month period were gathered prospectively"
Levente 2017	Not an RCT: prospective observational trial
Levine 2003	Different population: "patients with traumatic mid and distal femur fractures"
Li 2013	Different intervention: all participants had the same blocks; they were randomized by type of general anaesthesia
Lopez 2003	Not an RCT: "a fascia iliaca compartment block was performed on all of them"
Mannion 2005	Different intervention: this was a randomized trial of 36 participants who were having hip fracture surgery. All participants had a psoas block and general anaesthesia. Participants were randomized

Study	Reason for exclusion
	to 3 groups. A control group received a psoas block and IV saline, another group received psoas block and IV clonidine 1 mg/kg, and a third group received a psoas block and perineural clonidine. The interval from time of completion of block to first supplementary analgesic administration was longer in the IV clonidine group. Results show no significant differences among groups regarding postoperative adverse effects. We excluded the study, as investigators included no 'control' group that received no block
Manohara 2015	Different intervention: comparison between ultrasound-guided supra-inguinal fascia iliaca block and femoral nerve block
Marhofer 1998	Different intervention: this was a randomized trial of 60 participants. 20 received a 3-in-1 block with ultrasound guidance with 20 mL 0.5% bupivacaine, 20 received 20 mL of 0.5% bupivacaine, and 20 received 30 mL of 0.5% bupivacaine, with nerve stimulator guidance. We excluded the study, as investigators included no comparison with a group without nerve block
Masoumi 2014	Different population: type of fracture: femoral intertrochanteric (N = 30), femoral neck (N = 17), or femoral shaft fracture (N = 13). No email address to obtain results from proximal end fractures separately
Matot 2003	Different intervention: epidural analgesia
McGlone 1987	Not an RCT: "all received a femoral nerve block"
McRae 2015	Different population: 6 participants with shaft fracture. Letter sent 17 March 2016, to request separate data for participants with a proximal fracture; no reply
Memary 2015	Different population: "elective femoral shaft fracture"
Mostafa 2015	Different population: "femur fracture". We were unable to confirm the exact site of femur fracture from study author
Mutty 2007	Different population: this was a randomized trial comparing femoral nerve block vs no block for 54 participants with a femoral shaft or distal femoral fracture. We excluded the study, as it included no proximal femoral fractures
Nielsen 2015	Different intervention: "the aim of this trial is to test the analgesic effect of a femoral nerve block in combination with an obturator nerve block compared to femoral nerve block alone"
Pakhare 2016	Different population: "objective: to compare the analgesic efficacy of femoral nerve block and IV fentanyl in femur shaft fracture patients for positioning them for neuraxial block"
Parras 2016	Different intervention: comparison of quadratus lumborum block type vs femoral nerve block
Perrier 2010	Not an RCT: "prospective, observational study"
Piangatelli 2004	Different intervention: this was a randomized study of 80 participants undergoing lower extremity surgery that compared 4 different methods. A lumbar plexus block with 30 mL 0.5% levobupivacaine or a lumbar plexus block with 30 mL 0.75% ropivacaine or a sciatic nerve block with 10 mL 0.75% ropivacaine or a sciatic nerve block with 10 mL 0.5% levobupivacaine. We excluded the study from this review, as investigators included no 'control' group without nerve block
Randall 2008	Not an RCT: audit on nurse administering peripheral nerve blocks
Rapchuk 2013	Not an RCT: case series of 4 patients
Rashwan 2013	Different intervention: comparison of fascia iliaca vs epidural analgesia

Study	Reason for exclusion
Reavley 2015	Different intervention: comparison between fascia iliaca block and femoral (3-in-1) block for preoperative analgesia in the emergency department
Reddy 2016	Different population: 8 participants with shaft fracture and 12 participants with distal femur fracture. We were unable to obtain data for proximal femur fractures separately
Rojas Rivera 2002	Not an RCT: prospective observational study
Sahota 2011	Different intervention: both groups could have a single-injection block, but the catheter for a continuous infusion was allowed only for the intervention group: "common practice at our institution is to place a femoral nerve block either to facilitate patient positioning for a spinal anaesthetic or as postoperative analgesia in patients having general anaesthesia. This will be permitted in patients in the control group, however catheter insertion is not"
Scheinin 2000	Different intervention: epidural analgesia
Segado Jimenez 2010	Different population: study authors informed us that the trial included participants with hip fracture and participants without hip fracture undergoing elective hip arthroplasty. They could not give us data separately for participants with and without hip fracture: "I did not register which patients were hip fractures, just the type of surgery"
Shi 2018	Different population: hip replacement; the word "fracture" is not mentioned anywhere in the report
Sia 2004	Different population: femoral shaft fractures
Siguira 2014	Terminated on 1 June 2015
Singh 2016	Different population: intertrochanteric femur fracture (70%), L/C (not defined) femur fracture (1.7%), femoral neck fracture (16.7%), mid-shaft femur fracture (6.7%), or S/T (not defined) femur fracture (5%). We were unable to obtain data for proximal femur fracture separately
Sonawane 2019	Different intervention: comparison between different peripheral nerve blocks
Swart 2017	Different intervention: "subcutaneous injection at conclusion of surgical fixation of hip fracture"
Tao 2016	Not an RCT: cross-sectional study to be used for planning an RCT
Thakur 2018	Not an RCT: "observational"
Turker 2003	Different intervention: this was a randomized study of 30 participants who underwent partial hip replacement surgery. 15 received general anaesthesia plus epidural block with 15 mL of 0.5% bupivacaine, and 15 received general anaesthesia plus psoas compartment block with 30 mL of 0.5% bupivacaine. Both groups had similar pain scores, but the epidural group showed greater drops in mean arterial blood pressure from baseline and more complications. We excluded the study from this review because it did not include a control group that did not receive nerve block
Van Leeuwen 2000	Different intervention: this was a randomized study of 3 different combinations of doses of local anaesthetics given to produce a 'three in one' femoral nerve block. We excluded this study from the review because it did not include a 'control' group that did not receive nerve block
Vats 2016	Not an RCT: "in this observational study"
Wang 2019	Not an RCT: "study type: observational study"
Wei 2018	Different intervention: all participants will have a peripheral nerve block

Study	Reason for exclusion
WHO Int 2007	Study terminated in 2010
Williams 2016	Not an RCT: probably retrospective: "in patients with femoral neck fracture, 69 patients who received standard preoperative analgesia (regular paracetamol 1 g 4 times a day, codeine 60 mg 4 times a day, and opioid 10 mg 2 hourly as required) were compared with 50 patients who received standard preoperative analgesia plus FICB"
Zadeh 2015	Different intervention: comparison of femoral nerve block vs fascia iliaca block
Zheng 2017	Different intervention: comparison of injection below vs at the level of inguinal ligament for fascia iliaca block

FICB (FIB): fascia iliaca compartment block (fascia iliaca block).
RCT: randomized controlled trial.

Characteristics of ongoing studies *[ordered by study ID]*

Capelleri 2017

Study name	Early femoral block in elderly with hip fracture
Methods	Parallel RCT, triple (participant, investigator, outcomes assessor) Approved by the ethics committee and informed consents obtained Site: Italy Data collection: to be determined Funding: to be determined Registration: NCT03092466
Participants	600 elderly participants > 70 years of age with hip fracture and admission to emergency department from Monday to Friday (from 8H00 AM to 20H00 PM) Excluded: ASA physical status > III, contraindications to regional anaesthesia, allergic to 1 or more drugs used in the study, unable or refuse to provide informed consent, show cognitive impairment or signs of confusion or delirium already on arrival to emergency department, postoperative intensive care unit admission, haemoglobin value < 8 g/dL at admission Type of fracture: femoral neck fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined Percentage female: %: to be determined Length of follow-up: 12 months
Interventions	Intervention: continuous femoral nerve block Comparator: sham block
Outcomes	Relevant to this review. 1. Pain. 2. Acute confusional state (from hospital admission to home discharge).

Capelleri 2017 (Continued)

3. Myocardial ischaemia.
4. Pneumonia.
5. Mortality.
6. Complications.

Not relevant to this review.

1. Hospital length of stay.

Starting date	First posted: 28 March 2017 Study start date: 26 February 2017 Study completion date: 23 October 2020 Last update posted: 31 July 2019
Contact information	Gianluca Cappelleri
Notes	Conflict of interest: to be determined DOI: to be determined

Carvalho 2015

Study name	Contribution of anaesthesia technique for post-operative mortality reduction after proximal femur fractures surgical treatment - a randomized clinical trial
Methods	Parallel RCT, double-blind (investigator, outcome assessor) Approved by the ethics committee and informed consent obtained: to be determined Site: Centro Hospitalar do Porto, Portugal Data collection: to be determined Funding: to be determined Registration: NCT02406300
Participants	260 adults (≥ 60 years of age) admitted with a diagnosis of proximal femur fracture (ICD-9 codes 820.0 to 820.9) and submitted to surgical internal fixation of femur or hip prosthesis (ICD-9 codes 7935, 8151, and 8152) Exclusion criteria: multiple fractures, polytrauma, active malignancy, ASA physical status V, antiplatelet drugs (other than aspirin) in previous 5 days, known allergies to local anaesthetics, contraindication to general or regional anaesthesia Type of fracture: proximal femur fracture Anaesthetic technique for surgery: general anaesthesia in the intervention group and spinal block in the comparator group Surgical technique: to be determined Mean age: (range) to be determined Percentage female: % to be determined Length of follow-up: 1 year
Interventions	Intervention: femoral, lateral femoral cutaneous nerve of the thigh and anterior obturator nerve blocks

Peripheral nerve blocks for hip fractures in adults (Review)

Carvalho 2015 (Continued)

Comparator: no block

Outcomes	Relevant to this review. 1. Mortality. 2. Acute confusional state (up to 1 week postoperatively). Not relevant to this review. 1. Quality of life (30 days and 1 year after surgery).
Starting date	First posted: 2 April 2015 Study start date: April 2015 Study completion date: January 2017 Last update posted: 2 April 2015
Contact information	Raul Carvalho, MD
Notes	Conflict of interest: to be determined DOI: to be determined

Chinachoti 2010

Study name	Intrathecal morphine, femoral nerve block, periarticular bupivacaine infiltration for pain after intramedullary hip screw
Methods	Parallel RCT, single masking (outcomes assessor) Approved by the ethics committee and informed consent obtained: to be determined Site: Mahidol University, Taiwan Data collection: to be determined Funding: to be determined Registration: NCT01219088
Participants	80 ASA I to III participants with femoral neck fracture from 18 to 90 years of age Excluded: contraindication to spinal anaesthesia, inability to use patient-controlled analgesia, body weight < 30 kg, body mass index > 35 kg/m ² , history of research drug allergy, previous history of hip surgery on the same side, pathological fracture (severe infection, bone cancer) Type of fracture: femur fracture Anaesthetic technique for surgery: spinal anaesthesia Surgical technique: intramedullary hip screw Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 48 hours Excluded: patients with contraindication to spinal anaesthesia, inability to use patient-controlled analgesia, body weight < 30 kg, body mass index > 35 kg/m ² , history of research drug allergy, previous history of hip surgery on the same side, pathological fracture (severe infection, bone cancer)
Interventions	Intervention: femoral nerve block

Chinachoti 2010 (Continued)

Comparator 1: no block

Comparator 2: intrathecal morphine

Comparator 3: periarticular infiltration

Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain. 2. Opioids. 3. Participant satisfaction. Not relevant to this review. <ol style="list-style-type: none"> 1. Opioid side effects.
Starting date	First posted: 13 October 2010 Study start date: September 2010 Study completion date: September 2012 Last update posted: 4 August 2011
Contact information	Thitima Chinachoti, MD
Notes	Conflict of interest: to be determined DOI: to be determined

Chiu 2016

Study name	Evaluating the addition of regional analgesia to reduce postoperative delirium in patients having hip fracture surgery (RASAPOD)
Methods	Parallel RCT, triple masking (participant, care provider, outcomes assessor) Approved by the ethics committee and informed consents obtained Site: Auckland City Hospital, New Zealand Data collection: to be determined Funding: to be determined Registration: NCT02689388
Participants	50 participants \geq 65 years of age with hip fracture requiring surgery Excluded: contraindication to peripheral nerve block or local anaesthetics; unable to do delirium or cognitive testing due to language, vision, or hearing impairment; unable to communicate with research staff due to language barrier; history of long-term opioid use (longer than 1 month); contraindication to general anaesthesia Type of fracture: hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined

Chiu 2016 (Continued)

Length of follow-up: 90 days

Interventions	Intervention: femoral nerve block Comparator: no block
Outcomes	Relevant to this review. 1. Acute confusional state. 2. Opioids. Not relevant to this review. 1. Hospital length of stay. 2. Recovery.
Starting date	First posted: 24 February 2016 Study start date: 28 August 2016 Study completion date: 31 December 2017 Last update posted: 18 July 2017
Contact information	Davina J McAllister
Notes	Conflict of interest: to be determined DOI: to be determined

ClinicalTrials.gov 2019

Study name	Fascia iliaca compartment blocks for pain control in hip fractures
Methods	Parallel RCT, open label Approved by the ethics committee and informed consent obtained Site: Medical University of South Carolina, Charleston, SC, USA Data collection: to be determined Funding: to be determined Registration: NCT04086914
Participants	32 participants \geq 50 years with low-energy hip fracture Excluded: anticoagulants, hardware present near injection site, preexisting nerve injury Type of fracture: low-energy acute hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 8 hours
Interventions	Intervention: fascia iliaca compartment block

Peripheral nerve blocks for hip fractures in adults (Review)

ClinicalTrials.gov 2019 (Continued)

Comparator: no block

Outcomes	Relevant to this review. 1. Pain. Not relevant to this review. 1. None stated.
Starting date	First posted: 12 September 2019 Study start date: 1 November 2019 Study completion date: 1 December 2020 Last update posted: 12 September 2019
Contact information	Medical University of South Carolina, Charleston, SC, USA
Notes	Conflict of interest: to be determined DOI: to be determined

Compere 2012

Study name	Hip fracture and perineural catheter
Methods	Parallel RCT, open label Approved by the ethics committee and informed consent obtained Site: University Hospital, Rouen, France Data collection: to be determined Funding: to be determined Registration: NCT01638845
Participants	314 ASA I to III participants aged ≥ 60 years undergoing surgery for hip fracture occurring less than 24 hours after fracture Excluded: contraindication to regional anaesthesia (constitutional or acquired disorder of coagulation), sepsis, local infection of the puncture area, history of vascular femoral prosthetic surgery, prosthetic neuropathy, allergy to local anaesthetics, weight < 40 kg, respiratory failure, severe liver failure, brain injury associated with intracranial hypertension, uncontrolled epilepsy, simultaneous treatment with monoamine oxidase inhibitor, persons not affiliated with a health insurance plan Type of fracture: hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 12 months
Interventions	Intervention: continuous femoral nerve block (N = 157)

Compere 2012 (Continued)

Comparator: no block (N = 157)

Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain. 2. Myocardial ischaemia. 3. Mortality (up to 1 year). Not relevant to this review. <ol style="list-style-type: none"> 1. Cognitive function.
Starting date	First posted: 12 July 2012 Study start date: July 2012 Study completion date: July 2016 Last update posted: 17 August 2016
Contact information	Vincent Compere
Notes	Conflict of interest: to be determined DOI: to be determined

Cong 2016

Study name	Nerve block anesthesia and general anesthesia: influence on postoperative cognitive dysfunction after hip arthroplasty of aged patients with femoral neck fracture (a randomized controlled trial)
Methods	Parallel RCT Approved by the ethics committee and informed consents obtained Site: Shanghai 10th Hospital, Shanghai, China Data collection: 1 June 2017 to 1 October 2019 Funding: departmental/institutional Registration: ChiCTR-INR-16009481
Participants	100 participants between 60 and 80 years of age with normal mental status and unilateral hip fracture undergoing hip arthroplasty Excluded: severe respiratory disease, preoperative cognitive dysfunction Type of fracture: femoral neck fracture Anaesthetic technique for surgery: to be determined Surgical technique: hip arthroplasty Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 3 months
Interventions	Intervention 1: nerve block plus enhanced recovery protocol (N = 25) Intervention 2: nerve block without enhanced recovery protocol (N = 25)

Cong 2016 (Continued)

Comparator 1: no block plus general anaesthesia (N = 25)

Comparator 2: no block and no general anaesthesia (N = 25)

Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Acute confusional state (up to 3 months after surgery). <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Cognition function. 2. Bispectral index. 3. S100B protein. 4. Functional recovery. 5. Cerebral oxygen saturation. 6. Minerals.
Starting date	<p>First posted: 18 October 2016</p> <p>Study start date: to be determined</p> <p>Study completion date: to be determined</p> <p>Last update posted: 18 April 2017</p>
Contact information	Ruijun Cong
Notes	<p>Conflict of interest: to be determined</p> <p>DOI: to be determined</p>

Dhimar 2017

Study name	Analgesic effect provided by femoral nerve block versus intravenous fentanyl prior to positioning for subarachnoid block in patients with fracture femur
Methods	<p>Parallel RCT, open label</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Medical College and SSG Hospital, Vadodara, India</p> <p>Data collection: to be determined</p> <p>Funding: to be determined</p> <p>Registration: retrospectively registered 4 October 2017</p>
Participants	<p>60 ASA I to III participants posted for fracture surgery under subarachnoid block; the exact site of fracture is not specified</p> <p>Excluded: contraindications to subarachnoid block; allergy to amide local anaesthetics or fentanyl; history of drug or alcohol abuse; morbid obesity (body mass index > 29 kg/m²); comorbid condition such as diabetes, hypertension, bronchial asthma, chronic pulmonary obstructive disease; neurological or musculoskeletal disease; multiple fractures; refusal or inability to understand visual analogue pain scale score; use of analgesics 8 hours before performance of subarachnoid block</p> <p>Type of fracture: femur fracture</p> <p>Anaesthetic technique for surgery: spinal anaesthesia</p> <p>Surgical technique: to be determined</p>

Peripheral nerve blocks for hip fractures in adults (Review)

Dhimar 2017 (Continued)

	Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 90 minutes
Interventions	Intervention: femoral nerve block Comparator: no block
Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain. 2. Opioids. 3. Complications. Not relevant to this review. <ol style="list-style-type: none"> 1. Quality of positioning. 2. Time required for spinal block. 3. Haemodynamic variables. 4. Opioid side effects.
Starting date	First posted: 5 November 2019 Study start date: 12 May 2015 Study completion date: to be determined Last update posted: 5 November 2019
Contact information	Dr Aditi A Dhimar
Notes	Conflict of interest: to be determined DOI: to be determined

Diakomi 2015

Study name	Fascia iliaca compartment block in acute and chronic pain management in hip fracture patients
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: Asklepion General Hospital Athens, Voula, Greece Data collection: June 2015 to March 2018 Funding: to be determined Registration: NCT02479828
Participants	198 ASA I to III participants from 18 to 90 years old with intertrochanteric femur or femoral neck fracture Excluded: existing pain in hip joint to be operated, cognitive or mental disorder, administration of analgesic drugs before surgery, contraindications of spinal anaesthesia, refusal to participate in the study Type of fracture: to be determined Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined

Peripheral nerve blocks for hip fractures in adults (Review)

Diakomi 2015 (Continued)

	Percentage female: % to be determined
	Length of follow-up: 6 months
Interventions	Intervention: fascia iliaca compartment block Comparator: no block
Outcomes	Relevant to this review. 1. Pain. Not relevant to this review. 1. Chronic pain at 6 months.
Starting date	First posted: 24 June 2015 Study start date: June 2015 Study completion date: January 2018 Last update posted: 12 March 2019
Contact information	Maria Diakomi
Notes	Conflict of interest: to be determined DOI: to be determined

El Sharkawy 2016

Study name	Fascia iliaca compartment block for proximal-end femur fractures
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: Mansoura University, Mansoura City, Egypt Data collection: to be determined Funding: to be determined Registration: retrospectively registered NCT02696915
Participants	60 ASA physical status I to III participants scheduled for fixation of proximal end femur fracture Excluded: patients who refused, morbid obesity (body mass index > 40 kg/m ²), bleeding diathesis, previous femoral bypass surgery, inguinal hernia, inflammation/infection over injection site, peripheral neuropathy, allergy to local anaesthetic agents, severely altered consciousness level, psychiatric disorder, polytrauma Type of fracture: proximal end femur fracture Anaesthetic technique for surgery: spinal anaesthesia Surgical technique: to be determined Mean age: (range) to be determined Percentage female: % to be determined Length of follow-up: 24 hours

El Sharkawy 2016 (Continued)

Interventions	Intervention: iliaca compartment block Comparator: sham block
Outcomes	Relevant to this review. 1. Pain. 2. Opioids. Not relevant to this review. 1. Haemodynamic variables. 2. Time to perform spinal block. 3. Duration of analgesia.
Starting date	First posted: 2 March 2016 Study start date: January 2015 Study completion date: August 2015 Last update posted: 8 March 2016
Contact information	Reem A El Sharkawy
Notes	Conflict of interest: to be determined DOI: to be determined

Kulkarni 2018

Study name	USG guided fascia iliaca compartment block for post operative analgesia in proximal femur fracture
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: MGM Medical College and Hospital, Navi Mumbai, India Data collection: to be determined Funding: to be determined Registration: CTRI/2018/12/016679
Participants	128 ASA I to III participants between 50 and 80 years of age undergoing proximal femur fracture surgery requiring spinal anaesthesia Excluded: patients who refused, bleeding diathesis, inguinal hernia, inflammation/infection over injection site, allergy to local anaesthetic agents used, altered consciousness level, psychiatric disorder, polytrauma, morbid obesity Type of fracture: proximal femur fracture Anaesthetic technique for surgery: spinal anaesthesia Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined

Kulkarni 2018 (Continued)

Length of follow-up: 24 hours

Interventions	Intervention: fascia iliaca compartment block (N = 64) Comparator: no block (N = 64)
Outcomes	Relevant to this review. 1. Opioids. Not relevant to this review. 1. Opioid side effects.
Starting date	First posted: 14 December 2018 Study start date: 20 December 2018 Study completion date: to be determined Last update posted: 5 November 2019
Contact information	Dr Sanhita Jiten Kulkarni
Notes	Conflict of interest: to be determined DOI: to be determined

Levins 2006

Study name	Intra- and post-operative analgesia for patients undergoing surgery for hip fracture - role of fascia iliaca compartment block
Methods	Parallel RCT, double-blind (participants and caregivers) Approved by the ethics committee and informed consent obtained Site: Selly Oak Hospital, Birmingham, UK Data collection: to be determined Funding: governmental Registration: retrospectively registered ISRCTN75659782
Participants	40 adult participants of ASA I to III admitted to Selly Oak Hospital with hip fracture and scheduled for fixation will be recruited after consent is obtained Exclusion criteria: dementia/confusion, preoperative chest infection and/or poor respiratory function, temperature $\geq 38^{\circ}\text{C}$, white cell count $> 11,000/\text{mm}^3$, respiratory rate $> 25/\text{min}$, auscultation and/or chest X-ray evidence, $\text{SpO}_2 < 90\%$ on air, congestive cardiac failure, bed-bound or use of ≥ 2 aids for mobilization pre-fracture, malignancy, coagulopathy, known or suspected allergy to ropivacaine and/or morphine, local infection at site where the block is to be performed, refusal of permission to approach general practitioner Type of fracture: hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined

Levins 2006 (Continued)

	Percentage female: % to be determined
	Length of follow-up: 24 hours
Interventions	Intervention: fascia iliaca compartment block (N = 20) Comparator: morphine (N = 20)
Outcomes	Relevant to this review. <ol style="list-style-type: none"> 1. Pain. 2. Mortality. 3. Opioids. 4. Complications. Not relevant to this review. <ol style="list-style-type: none"> 1. Duration of analgesia. 2. Recovery room length of stay. 3. Opioid side effects. 4. Cognitive function. 5. Functional recovery.
Starting date	First posted: 28 September 2007 Study start date: 4 April 2006 Study completion date: 4 April 2007 Last update posted: 12 October 2017
Contact information	FA Levins, UK
Notes	Conflict of interest: to be determined DOI 10.1186

Li 2018

Study name	Effect of continuous lumbar plexus block combined with dexmedetomidine on postoperative delirium in elderly patients with hip fractures: a prospective, randomized controlled trial
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: Shanghai General Hospital, China Data collection: to be determined Funding: departmental/institutional Registration: ChiCTR1900021549
Participants	280 ASA I to III participants ≥ 65 years of age with hip fracture undergoing surgery Excluded: compound injury (multiple fractures, combined with trauma of the head, chest, abdomen, pelvis, and parts other than the hip), contraindications for lumbar plexus block (puncture site infection, peripheral neuropathy, local anaesthetic allergy, etc.), coexisting neurological dis-

Li 2018 (Continued)

	<p>ease (Alzheimer's disease, vascular dementia, and other diseases that affect cognitive function), allergy to the test drug, participated in other clinical trials</p> <p>Type of fracture: hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined</p> <p>Mean age (range): to be determined Percentage female: % to be determined Length of follow-up: 7 days</p>
Interventions	<p>Intervention 1: continuous posterior lumbar plexus block and dexmedetomidine (N = 70)</p> <p>Intervention 2: continuous posterior lumbar plexus block and no dexmedetomidine (N = 70)</p> <p>Comparator 1: no block and dexmedetomidine (N = 70)</p> <p>Comparator 2: no block and no dexmedetomidine (N = 70)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Mortality. 3. Opioids. 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Cognitive function. 2. Inflammation. 3. Quality of life.
Starting date	<p>First posted: 27 February 2019</p> <p>Study start date: 15 March 2019</p> <p>Study completion date: 15 March 2021</p> <p>Last update posted: 27 February 2019</p>
Contact information	Jin Bao Li, Jian Hai Zhang
Notes	<p>Conflict of interest: to be determined</p> <p>DOI: to be determined</p>

Luo 2019

Study name	Effects of ultrasound-guided continuous modified fascia iliaca compartment block for postoperative recovery in elderly patients with femoral fracture
Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: The First Affiliated Hospital of Nanchang University, Jiangxi, China</p> <p>Data collection: 1 May 2010 to 1 December 2019</p> <p>Funding: to be determined</p> <p>Registration: ChiCTR1900022595</p>

Luo 2019 (Continued)

Participants	<p>60 ASA I to III participants between 60 and 85 years of age undergoing elective surgery for unilateral femoral fracture under spinal anaesthesia</p> <p>Excluded: fractures in other sites, pulmonary infection or lower extremity venous thrombosis before surgery, severe puncture site infection or damage, psychiatric or neurological disorder, history of coagulation dysfunction or haemorrhagic disease, severe liver dysfunction (\geq Child-Pugh level 3), severe renal dysfunction (serum creatinine $\geq 177\mu\text{mol/L}$)</p> <p>Type of fracture: femoral fracture</p> <p>Anaesthetic technique for surgery: spinal anaesthesia</p> <p>Surgical technique: to be determined</p> <p>Mean age: to be determined</p> <p>Percentage female: to be determined</p> <p>Length of follow-up: 48 hours</p>
Interventions	<p>Intervention: continuous modified fascia iliaca compartment block (N = 30)</p> <p>Comparator: no block (N = 30)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain scores. 2. Acute confusional state. 3. Pressure sores. 4. Opioids. 5. Participant satisfaction. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Haemodynamic variables. 2. Inflammation. 3. Stress hormones. 4. Catecholamines. 5. Deep venous thrombosis. 6. Quality of recovery.
Starting date	<p>First posted: 18 April 2019</p> <p>Study start date: 1 May 2019</p> <p>Study completion date: 1 December 2019</p> <p>Last update posted: 18 April 2019</p>
Contact information	Foquan Luo
Notes	<p>Conflict of interest: to be determined</p> <p>DOI: to be determined</p>

Mathijssen 2015

Study name	Femoral nerve blockage in proximal femoral fractures in patients 65 years of age or older, a randomised controlled trial
Methods	<p>Parallel RCT, double-blind</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Reinier de Graaf Hospital, Delft, The Netherlands</p>

Mathijssen 2015 (Continued)

	<p>Data collection: to be determined</p> <p>Funding: to be determined</p> <p>Registration: EudraCT Number: 2015-004119-19</p>
Participants	<p>84 participants with proximal femoral fracture, normal lower extremity anatomy and neurovascular examination, pain score ≥ 4 at admission, 65 years of age or older</p> <p>Excluded: cognitive impairment, previously diagnosed with dementia or Mini Mental score ≤ 22, delirium at inclusion, no good understanding of the Dutch language, known hypersensitivity to local anaesthetics or morphine, multiple trauma, pre-injury use of opioids, pre-injury bedridden or wheelchair-bound</p> <p>Type of fracture: proximal femoral fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined</p> <p>Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: in hospital</p>
Interventions	<p>Intervention: repeated doses femoral nerve block</p> <p>Comparator: sham block</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Opioids. 4. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Length of hospital stay. 3. Functional status. 4. Discharge location.
Starting date	<p>First posted: 22 February 2016</p> <p>Study start date: 25 April 2016</p> <p>Study completion date: to be determined</p> <p>Last update posted: 9 May 2016</p>
Contact information	Nina Mathijssen, The Netherlands
Notes	<p>Conflict of interest: to be determined</p> <p>DOI: to be determined</p>

Nguyen 2018

Study name	Impact of fascia iliaca block in hip fracture patients
Methods	Parallel RCT, open label

Peripheral nerve blocks for hip fractures in adults (Review)

Nguyen 2018 (Continued)

	<p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Texas Tech University Health Sciences Center, El Paso, TX, USA</p> <p>Data collection: February 2018 to May 2019</p> <p>Funding: to be determined</p> <p>Registration: NCT03525977</p>
Participants	<p>97 participants from 18 to 99 years of age with femoral neck and intertrochanteric hip fractures requiring surgery</p> <p>Excluded: polytrauma; pathological fracture; required revision procedure; long-term opioid use; clinical status that precludes verbal pain assessment such as dementia; head injury; unwillingness to participate</p> <p>Type of fracture: femoral neck and intertrochanteric hip fractures</p> <p>Anaesthetic technique for surgery: to be determined</p> <p>Surgical technique: to be determined</p> <p>Mean age: (range): to be determined</p> <p>Percentage female: % to be determined</p> <p>Length of follow-up: 2 days</p>
Interventions	<p>Intervention: fascia compartment iliaca block</p> <p>Comparator: no block</p>
Outcomes	<p>Relevant to this review.</p> <p>1. Pain.</p> <p>Not relevant to this review.</p> <p>1. Rehabilitation.</p>
Starting date	<p>First posted: 16 May 2018</p> <p>Study start date: 20 February 2018</p> <p>Study completion date: 1 May 2019</p> <p>Last update posted: 27 May 2019</p>
Contact information	<p>Mai P Nguyen, USA</p>
Notes	<p>Conflict of interest: to be determined</p> <p>DOI: to be determined</p>

Park 2009

Study name	<p>Ultrasound guided femoral nerve block using 1% ropivacaine as a method of pain control in patients who present to emergency with a fractured hip</p>
Methods	<p>Parallel RCT, open label</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: St Vincent's Hospital, New South Wales, Australia</p>

Peripheral nerve blocks for hip fractures in adults (Review)

Park 2009 (Continued)

	Data collection: to be determined Funding: institutional/departmental Registration: retrospectively registered; ACTRN12609000526279
Participants	46 participants 18 years of age and older with radiologically proven fractured neck of femur Excluded: pregnant or lactating; allergy to ropivacaine, paracetamol, or morphine; anticoagulated patients; those with significant coagulation abnormalities; localized injection site infection; neurological deficits in distribution of the femoral nerve; severe hepatic disease; unable to give consent themselves; history of heart block; on amiodarone; acute cardiac event in the last 3 months Type of fracture: femoral neck fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: to be determined Percentage female: to be determined Length of follow-up: 24 hours
Interventions	Intervention: femoral nerve block Comparator: no block
Outcomes	Relevant to this review. 1. Pain. 2. Opioids. Not relevant to this review. 1. No other outcome stated
Starting date	First posted: 10 June 2009 Study start date: 4 April 2009 Study completion date: to be determined Last update posted: 6 July 2012
Contact information	Dr Edmond Park
Notes	Conflict of interest: to be determined DOI: to be determined

Postma 2017

Study name	Morphine use in the fascia iliaca compartment block with ultrasound guidance (MORFICUS)
Methods	Parallel RCT, with quadruple masking (participant, care provider, investigator, outcomes assessor) Approved by the ethics committee and informed consents obtained Site: Zuyderland Medisch Centrum, Heerlen, The Netherlands Data collection: 28 January 2019 to 1 February 2020 Funding: departmental/institutional plus industry Registration: EUCTR2016-004698-42-NL 2016

Postma 2017 (Continued)

Participants	<p>120 participants \geq 18 years of age diagnosed with a proximal femoral fracture (femoral neck, trochanteric and subtrochanteric femoral fracture) upon arrival at the emergency department</p> <p>Excluded: no informed consent, skin infection at injection site(s), morphine allergy, levobupivacaine allergy, operation within an hour after admission, inability to understand and quantify pain on an NRS scale, history of dementia, neurological deficit of fractured leg upon arrival at the emergency department, trauma with multiple fractures (more than 1), risk of compartment syndrome of ipsilateral lower leg, proximal femoral fracture with other definitive treatment than operation, transfer to another hospital, actual morphine use, distracting pain in other location than hip, pregnancy, no physician/nurse available for procedure, body mass index > 40, saturation $< 90\%$, previously unreported hypotension (systolic blood pressure < 100 mmHg) or ASA IV or higher</p> <p>Type of fracture: femoral neck, trochanteric or subtrochanteric femoral fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined</p> <p>Mean age: (range): to be determined Percentage female: % to be determined</p> <p>Length of follow-up: 30 days</p>
Interventions	<p>Intervention: fascia iliaca compartment block</p> <p>Comparator: sham block</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Mortality (up to 30 days). 4. Opioid consumption. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Opioid side effects. 2. Hospital length of stay. 3. Block duration. 4. Time to perform the procedure.
Starting date	<p>First posted: 4 January 2017</p> <p>Study start date: 29 May 2017</p> <p>Study completion date: 1 February 2020</p> <p>Last update posted: 26 February 2019</p>
Contact information	<p>Rory O'Connor, Sanne Postma</p> <p>Sponsor's protocol code number 10102016</p>
Notes	<p>Conflict of interest: sponsored by industry DOI: to be determined</p>

Qiu 2018

Study name	A randomized controlled trial for the efficacy of early analgesia by continuous fascia block under ultrasound guidance for elderly patients with hip fracture
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Qiu 2018 (Continued)

Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consents obtained</p> <p>Site: Fujian Provincial Hospital, Fujian, China</p> <p>Data collection: 1 October 2018 to 30 June 2019</p> <p>Funding: departmental/institutional</p> <p>Registration: ChiCTR1800018604</p>
Participants	<p>40 ASA I to III participants ≥ 65 years of age with X-ray-confirmed unilateral femoral neck fracture or intertrochanteric fracture; body mass index 18.5 to 30 kilograms per square meter</p> <p>Excluded: history of abnormal surgical anaesthesia recovery with serious injuries combined with other important organs, history of acute inflammation of the respiratory tract within 2 weeks, neuromuscular disease and mental illness, suspected abuse of narcotic analgesics or sedatives, known to be allergic to local anaesthetics or opioids, do not cooperate and cannot communicate</p> <p>Type of fracture: femoral neck fracture or intertrochanteric fracture</p> <p>Anaesthetic technique for surgery: to be determined</p> <p>Surgical technique: to be determined</p> <p>Mean age: (range): to be determined</p> <p>Percentage female: % to be determined</p> <p>Length of follow-up: in hospital</p>
Interventions	<p>Intervention: fascia iliaca compartment block (N = 20)</p> <p>Comparator: no block (N = 20)</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Mortality. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Haemodynamic variables. 2. Opioid side effects. 3. Intensive care unit length of stay. 4. Hospital length of stay.
Starting date	<p>First posted: 30 September 2018</p> <p>Study start date: 1 October 2018</p> <p>Study completion date: to be determined</p> <p>Last update posted: 30 September 2018</p>
Contact information	<p>Chun-Hua Qiu</p>
Notes	<p>Conflict of interest: to be determined</p> <p>DOI: to be determined</p>

Ridderikhof 2015

Study name	A multicenter randomized controlled trial in elderly patients with hip fractures comparing continuous fascia iliaca compartment block to systemic opioids and its effect on delirium occurrence
Methods	<p>Parallel RCT, open label</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Academisch Medisch Centrum - Universiteit van Amsterdam, The Netherlands</p> <p>Data collection: May 2016 to December 2021</p> <p>Funding: governmental</p> <p>Registration: NCT02689024</p>
Participants	<p>340 participants \geq 55 years of age with radiographically confirmed hip fracture</p> <p>Excluded: multiple injuries (polytrauma patients), previous adverse reaction or known allergy to local anaesthetics or opioids or paracetamol, skin infection in proximity of injection site, delirious state at presentation in the emergency department</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: to be determined</p> <p>Surgical technique: to be determined</p> <p>Mean age: (range): to be determined</p> <p>Percentage female: % to be determined</p> <p>Length of follow-up: 3 months</p>
Interventions	<p>Intervention: compartment fascia iliaca block</p> <p>Comparator: no block</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Mortality. 4. Opioids. 5. Participant satisfaction. 6. Cost. 7. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Hospital length of stay. 2. Intensive care unit admission. 3. Intensive care unit length of stay. 4. Hospital re-admission rate. 5. Functional recovery. 6. Quality of life. 7. Cognitive function.
Starting date	<p>First posted: 23 February 2016</p> <p>Study start date: May 2016</p> <p>Study completion date: April 2022</p>

Ridderikhof 2015 (Continued)

Last update posted: 27 March 2019

Contact information	Milan Ridderikhof, The Netherlands
Notes	Conflict of interest: to be determined DOI: to be determined

Saga 2019

Study name	Nurse led ultrasound guided femoral nerve block in the emergency department (URGENT)
Methods	Parallel RCT (open label) Approved by the ethics committee and informed consent obtained Site: University College of Southeast Norway Data collection: 15 December 2019 to 31 December 2022 Funding: departmental/institutional Registration: NCT04145752
Participants	50 ASA I to IV participants 18 to 110 years of age with radiologically confirmed hip fracture Excluded: dementia, known allergy to local anaesthetic used in femoral nerve block, anticoagulated or using platelet inhibitors (acetylsalicylic acid and dipyridamole are allowed), recent (last 2 hours) international normalized ratio > 1.5, pregnant women, < 18 years of age, severe head injury that leads to significant loss of consciousness (Glasgow coma score < 12), > 10 mg morphine administered pre-hospital, skin lesion/infection at block site, admitted with other suspected or verified fracture except small fractures in hands and feet Type of fracture: hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: in hospital
Interventions	Intervention: femoral nerve block (N = 25) Comparator: no block (N =25)
Outcomes	Relevant to this review. 1. Pain. 2. Acute confusional state. 3. Opioids. 4. Pneumonia. 5. Myocardial infarction. 6. Mortality. 7. Complications. Not relevant to this review. 1. Agitation. 2. Opioid side effects. 3. Time to perform the procedure. 4. Hospital length of stay. 5. Acute kidney injury.

Saga 2019 (Continued)

Starting date	First posted: 31 October 2019 Study start date: 15 December 2019 Study completion date: 31 December 2022 Last update posted: 31 October 2019
Contact information	Espen Lindholm, Tømm Bernklev
Notes	Conflict of interest: to be determined DOI: to be determined

Sahiti 2019

Study name	A randomized control study to evaluate the efficacy of ultrasound guided pre-emptive fascia iliaca compartment block for postoperative analgesia in femur and hip fracture surgeries
Methods	Parallel RCT, outcome assessor blinded Approved by the ethics committee and informed consent obtained Site: SRM Medical College Hospital and Research Centre, Tamil Nadu, India Data collection: to be determined Funding: to be determined Registration: CTRI/2019/04/018488
Participants	60 ASA I to III participants 18 to 75 years of age with body mass index between 18.5 and 25 kg/m ² admitted for elective femur and hip fracture surgeries under spinal anaesthesia Excluded: ASA IV and above, allergy to local anaesthetics, coagulation abnormalities Type of fracture: hip fracture Anaesthetic technique for surgery: spinal anaesthesia Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 24 hours
Interventions	Intervention: fascia iliaca compartment block Comparator: no block
Outcomes	Relevant to this review. 1. Opioids. Not relevant to this review. 1. Duration of analgesia. 2. Quality of positioning for spinal block.
Starting date	First posted: 8 April 2019 Study start date: 01 May 2019

Sahiti 2019 (Continued)

	Study completion date: to be determined
	Last update posted: 5 November 2019
Contact information	Tomurthy Sahithi
Notes	Conflict of interest: to be determined
	DOI: to be determined

Shah 2016

Study name	Analgesia for positioning patient with femur fracture for spinal anaesthesia
Methods	<p>Parallel RCT, single-blinded</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Universiti Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia</p> <p>Data collection: October 2015 to December 2016</p> <p>Funding: to be determined</p> <p>Registration: retrospectively registered; NCT02983344</p>
Participants	<p>24 ASA I or II participants between 60 and 85 years of age undergoing elective surgery for repair of unilateral, single femoral fracture under spinal anaesthesia</p> <p>Excluded: contraindication to spinal anaesthesia, known hypersensitivity or contraindication to medication used in this study, morbid obesity (body mass index > 35 kg/m²), infection at the intended site of administration of fascia iliaca compartment block, impaired cognitive function</p> <p>Type of fracture: femoral neck or femoral shaft fracture</p> <p>Anaesthetic technique for surgery: spinal anaesthesia</p> <p>Surgical technique: to be determined</p> <p>Mean age: (range): to be determined</p> <p>Percentage female: % to be determined</p> <p>Length of follow-up: 24 hours</p>
Interventions	<p>Intervention: fascia iliaca compartment block</p> <p>Comparator: no block</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Participant satisfaction. 3. Complications. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Quality of positioning for spinal block.
Starting date	<p>First posted: 6 December 2016</p> <p>Study start date: October 2015</p>

Shah 2016 (Continued)

Study completion date: December 2016

Last update posted: 6 September 2017

Contact information	Dr Aida Mastura Mohd Shah
Notes	Conflict of interest: to be determined DOI: to be determined

Tsui 2015

Study name	Use of pre-operative nerve blocks in older patients with hip fracture: a pilot study
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: University of Alberta, Canada Data collection: June 2015 to December 2016 Funding: to be determined Registration: NCT02450045
Participants	75 participants ≥ 65 years or age, ambulatory pre-fracture, who sustained a low-energy hip fracture (i.e. fall from standing), have a Mini Mental Status Examination score ≥ 13 (moderate dementia), and received consent to participate in the study Excluded: admitted to hospital more than 30 hours from injury, regular use of opiate medications, Confusion Assessment Method (CAM) test not performed within 6 hours of ward admission, known allergy to local anaesthetic Type of fracture: low-energy hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 5 days
Interventions	Intervention: femoral nerve block Comparator: no block
Outcomes	Relevant to this review. 1. Pain. 2. Opioids. Not relevant to this review. 1. Cognitive function.
Starting date	First posted: 21 May 2015 Study start date: June 2015 Study completion date: December 2016

Tsui 2015 (Continued)

Last update posted: 26 October 2016

Contact information	Ban Tsui
Notes	Conflict of interest: to be determined DOI: to be determined

Winso 2009

Study name	Femoral nerve blockade in hip fracture patients: a randomised controlled trial
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: Umea University, Umea, Sweden Data collection: 30 March 2009 to 31 December 2010 Funding: governmental Registration: retrospectively registered; ISRCTN46653818
Participants	250 participants \geq 70 years of age with hip fracture Excluded: local infection, allergic to local anaesthesia, dying, pathological hip fracture Type of fracture: hip fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: (range): to be determined Percentage female: % to be determined Length of follow-up: 5 days
Interventions	Intervention: femoral nerve block Comparator: no block
Outcomes	Relevant to this review. 1. Pain. 2. Acute confusional state. 3. Mortality. 4. Pressure sores. 5. Complications. Not relevant to this review. 1. Thrombosis. 2. Congestive heart failure. 3. Cognitive function. 4. Quality of life.
Starting date	First posted: 5 May 2009 Study start date: 30 March 2009

Winso 2009 (Continued)

Study completion date: 31 December 2010

Last update posted: 13 January 2015

Contact information	Professor Ola Winso
Notes	Conflict of interest: to be determined DOI: to be determined

Xi 2014

Study name	A research of postoperative cognitive dysfunction of elderly patients after general anesthesia combined with nerve block or not for femoral fracture surgery
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: Shanghai Ninth People's Hospital, China Data collection: to be determined Funding: departmental/institutional Registration: ChiCTR-IPR-14005641
Participants	70 participants \geq 70 years of age undergoing femoral fracture surgery Excluded: anaesthesia within past 180 days, baseline Mini Mental State Examination score $<$ 17, Barthel Index of Activities of Daily Living $<$ 70, preexisting neuropsychiatric disease, nable to speak Chinese Type of fracture: to be determined Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age (range 70 to 95): to be determined Percentage female: % to be determined Length of follow-up: no information
Interventions	Intervention: nerve block (N = 35) Comparator: no nerve block (N = 35)
Outcomes	Relevant to this review. 1. Acute confusional state. Not relevant to this review. 1. Cognitive function. 2. S100 β .
Starting date	First posted: 10 December 2014 Study start date: 1 January 1990 (date of ethics committee approval 26 August 2013) Study completion date: to be determined

Xi 2014 (Continued)

Last update posted: 18 April 2017

Contact information	Siwei Xi
Notes	Conflict of interest: to be determined DOI: to be determined

Xuesheng 2019

Study name	Comparison of combined lumbar and sacral plexus block with low general anesthesia versus spinal anaesthesia on postoperative outcomes in elderly patients undergoing hip fracture surgery
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: The First Affiliated Hospital of Anhui Medical University, China Data collection: 12 August 2019 to May 2020 Funding: institutional/departmental Registration: ChiCTR1900025113
Participants	120 ASA I to IV participants 65 years of age or older scheduled for elective hip fracture surgery Excluded: dementia or severe cognitive dysfunction, unstable mental state or mental disease, psychotropic drugs, opioid abuse, delirium, history of delirium, anaesthesia and surgery within 6 months, visual or auditory language barrier affecting cognitive assessment, bilateral hip or other fracture surgery at the same time, cerebrovascular accident within the last 3 months, scheduled to receive prosthesis surgery Type of fracture: hip fracture Anaesthetic technique for surgery: general anaesthesia for the intervention group; spinal anaesthesia for the comparator group Surgical technique: fixation Mean age: to be determined Percentage female: to be determined Length of follow-up: 30 days
Interventions	Intervention: lumbosacral plexus block (N = 60) Comparator: no peripheral nerve block (N = 60)
Outcomes	Relevant to this review. 1. Acute confusional state. Not relevant to this review. 1. Quality of life.
Starting date	First posted: 12 August 2019 Study start date: 12 August 2019 Study completion date: May 2020 Last update posted: 12 August 2019
Contact information	Liu Xuesheng, Fang Panpan
Notes	Conflict of interest: to be determined DOI: to be determined

Yuan 2017

Study name	Efficacy of perioperative advanced protocol enhance recovery of elderly patients suffering limb fracture: a clinical study
Methods	<p>Parallel RCT</p> <p>Approved by the ethics committee and informed consent obtained</p> <p>Site: Shanghai Changzheng Hospital, China</p> <p>Data collection: to be determined</p> <p>Funding: to be determined</p> <p>Registration: ChiCTR-IOR-17012042</p>
Participants	<p>120 ASA II to III participants 60 to 90 years of age with simple hip fracture and undergoing surgery</p> <p>Excluded: long-term endocrine system disease; severe diabetic complications (diabetic ketoacidosis, hyperosmolar coma, diabetic nephropathy, macrovascular disease); severe gastrointestinal ulcer; blood system disease; severe liver and kidney disease (such as ALT, AST, bilirubin, and so on, more than twice the upper limit of normal; creatinine clearance rate < 30 mL/min); non-steroidal anti-inflammatory drug allergy history; aspirin allergy history; cerebrovascular accident within recent 3 months such as stroke, transient ischaemic attack, etc.; serious psychological problem; long psychiatric history or psychiatric drug history; drug addiction; allergy to any of the analgesic drugs</p> <p>Type of fracture: hip fracture</p> <p>Anaesthetic technique for surgery: to be determined</p> <p>Surgical technique: to be determined</p> <p>Mean age: (range): to be determined</p> <p>Percentage female: % to be determined</p> <p>Length of follow-up: no information</p>
Interventions	<p>Intervention: femoral nerve block before surgery and fascia iliaca block after surgery</p> <p>Comparator: no block</p>
Outcomes	<p>Relevant to this review.</p> <ol style="list-style-type: none"> 1. Pain. 2. Acute confusional state. 3. Costs. <p>Not relevant to this review.</p> <ol style="list-style-type: none"> 1. Inflammation. 2. Functional recovery.
Starting date	<p>First posted: 10 July 2017</p> <p>Study start date: 1 January 2017 (approved by ethics committee 26 August 2013)</p> <p>Study completion date: 30 December 2019</p> <p>Last update posted: 24 July 2017</p>
Contact information	Hongbin Yuan, Weiwei Li
Notes	Conflict of interest: to be determined

Yuan 2017 (Continued)

DOI: to be determined

Yun 2018

Study name	Clinical study on analgesia of Top-Tql lumbar quadratus muscle block induced by ultrasound-guided after PFNA surgery for senile femoral trochanteric fracture
Methods	Parallel RCT Approved by the ethics committee and informed consent obtained Site: Xiamen 5th Hospital, Fujian, China Data collection: 1 October 2018 to 1 December 2020 Funding: institutional/departmental Registration: ChiCTR1800016421
Participants	90 participants over 65 years old with confirmed femoral trochanteric fracture scheduled for internal fixation Excluded: local anaesthesia allergy, puncture site infection, severe cardiovascular disease or cerebrovascular complications, severe cognitive dysfunction Type of fracture: trochanteric fracture Anaesthetic technique for surgery: to be determined Surgical technique: to be determined Mean age: to be determined Percentage female: to be determined Length of follow-up: 72 hours
Interventions	Intervention: quadratus lumborum plexus block (N = 45) Comparator: no block (N = 45)
Outcomes	Relevant to this review. 1. Pain. Not relevant to this review. 1. Opioid side effects. 2. Duration of motor blockade.
Starting date	First posted: 1 June 2018 Study start date: 1 January 2018 (approved by ethics committee on 26 August 2013) Study completion date: 1 December 2020 Last update posted: 1 June 2018
Contact information	Wang Yun
Notes	Conflict of interest: to be determined DOI: to be determined

AMTS: Abbreviated 10-point Mental Test Score.

ASA: American Society of Anaesthesiologists physical status.

C: Celsius.

CAM Questionnaire: Confusion Assessment Method.

EQ-5D or EUROQOL: score for measurement of health-related quality of life.

G: gram.

ICD-9: list of codes for International Statistical Classification of Diseases and Related Health Problems.

IV: intravenous.

kg: kilogram.

kg/m²: kilogram per square metre.

mm: millimetre.

mmHg: millimetre of mercury.

MSMC ED: Maimonides Medical Center emergency department.

n: number.

NHS: Nottingham University Hospitals.

NRS: numerical rating scale.

OMC: orientation-memory-concentration.

RCT: randomized controlled trial.

RfPB: Research for Patient Benefit.

RISK OF BIAS

Legend:  Low risk of bias  High risk of bias  Some concerns

Risk of bias for analysis 1.1 Pain on movement within 30 minutes of block placement

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Subgroup 1.1.1 Fascia iliaca compartment block						
Albrecht 2014	✓	✓	✓	✓	✗	✗
Diakomi 2014	✓	✓	✓	✓	✓	✓
Domac 2015	✓	✓	✓	✓	✓	✓
Foss 2005a	✓	✓	✓	✓	✓	✓
Hogg 2009	✓	✓	✓	✓	✓	✓
Landsting 2008	✓	✓	✗	✓	✓	✗
Yun 2009	✓	✓	✓	✓	✓	✓
Subgroup 1.1.2 Femoral nerve block						
Gille 2006	✓	✓	✓	✓	✓	✓
Murgue 2006	✓	✓	✓	✓	✓	✓
Ranjit 2016	✓	✓	✓	✓	✓	✓

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Szucs 2010	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 1.2 Acute confusional state

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Subgroup 1.2.1 Peripheral nerve block based on landmarks						
Godoy Monzon 2010	✓	✓	✗	✓	✓	✗
Mouzopoulos 2009	✓	✓	✓	✓	✓	✓
Nie 2015	✓	✓	✓	✓	✓	✓
White 1980	✓	✓	✓	✓	✓	✓
Subgroup 1.2.2 Peripheral nerve block based on nerve stimulator						
Cuvillon 2007	✓	✓	✓	✓	✓	✓
Graham 2008	✓	✓	✓	✓	✓	✓
Kullenberg 2004	✓	✓	✓	✓	✓	✓
Subgroup 1.2.3 Peripheral nerve blocks inserted on ultrasound guidance						
Brownbridge 2018	✓	✓	✓	✓	✓	✓
Liebmann 2012	✓	✓	✓	✓	✓	✓
Morrison 2008	✓	✓	✓	✓	✓	✓
Uysal 2018	✓	✓	✓	✓	✓	✓
Yamamoto 2016	✓	✓	✓	✓	✓	✓

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Yang 2016	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 1.3 Myocardial infarction

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Altermatt 2013	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 1.4 Chest infections

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Fletcher 2003	✓	✓	✓	✓	✓	✓
Haddad 1995	✓	✓	✓	✓	✓	✓
White 1980	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 1.5 Mortality

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Subgroup 1.5.1 Single-injection block						
Albrecht 2014	✓	✓	✓	✓	✗	✗

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Fletcher 2003	✓	✓	✓	✓	✓	✓
Haddad 1995	✓	✓	✓	✓	✓	✓
Hood 1991	✓	✓	✓	✓	✓	✓
Jones 1985	✓	✓	✓	✓	✓	✓
White 1980	✓	✓	✓	✓	✓	✓
Subgroup 1.5.2 Continuous infusion						
Brownbridge 2018	✓	✓	✓	✓	✓	✓
Cuvillon 2007	✓	✓	✓	✓	✓	✓
De La Tabla 2010	✗	✓	✓	✓	✓	✗
Morrison 2008	✓	✓	✓	✓	✓	✓
Wang 2015	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 1.6 Time to first mobilization

Bias						
Study	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	Overall
Kullenberg 2004	✓	✓	✓	✓	✓	✓
Segado Jimenez 2009	✓	✓	✓	✓	✓	✓
Yamamoto 2016	✓	✓	✓	✓	✓	✓

Risk of bias for analysis 1.7 Costs of analgesic drugs

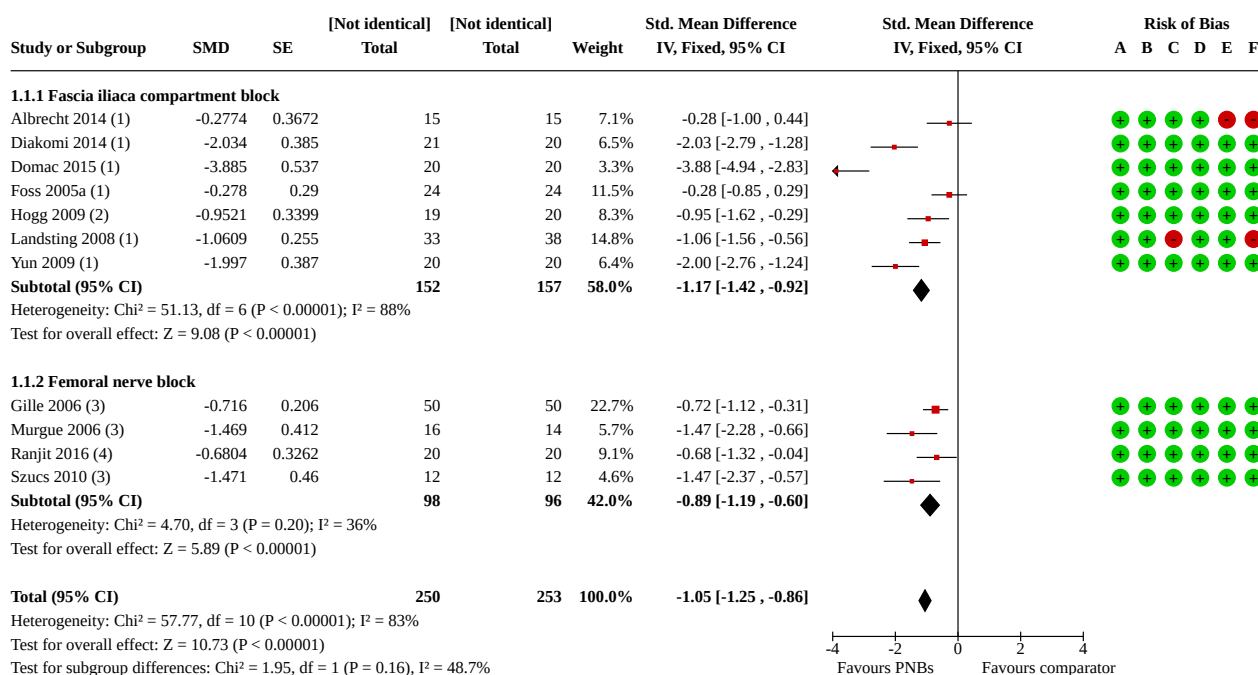
Study	Bias					Overall
	Randomisation process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported results	
Segado Jimenez 2009	✓	✓	✓	✓	✓	✓

DATA AND ANALYSES

Comparison 1. Peripheral nerve blocks (PNBs) versus no nerve block (or sham block)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Pain on movement within 30 minutes of block placement	11	503	Std. Mean Difference (IV, Fixed, 95% CI)	-1.05 [-1.25, -0.86]
1.1.1 Fascia iliaca compartment block	7	309	Std. Mean Difference (IV, Fixed, 95% CI)	-1.17 [-1.42, -0.92]
1.1.2 Femoral nerve block	4	194	Std. Mean Difference (IV, Fixed, 95% CI)	-0.89 [-1.19, -0.60]
1.2 Acute confusional state	13	1072	Risk Ratio (M-H, Fixed, 95% CI)	0.67 [0.50, 0.90]
1.2.1 Peripheral nerve block based on landmarks	4	501	Risk Ratio (M-H, Fixed, 95% CI)	0.70 [0.44, 1.13]
1.2.2 Peripheral nerve block based on nerve stimulator	3	182	Risk Ratio (M-H, Fixed, 95% CI)	0.55 [0.31, 0.97]
1.2.3 Peripheral nerve blocks inserted on ultrasound guidance	6	389	Risk Ratio (M-H, Fixed, 95% CI)	0.72 [0.44, 1.20]
1.3 Myocardial infarction	1	31	Risk Ratio (M-H, Fixed, 95% CI)	Not estimable
1.4 Chest infections	3	131	Risk Ratio (M-H, Fixed, 95% CI)	0.41 [0.19, 0.89]
1.5 Mortality	11	617	Risk Ratio (M-H, Fixed, 95% CI)	0.87 [0.47, 1.60]
1.5.1 Single-injection block	6	235	Risk Ratio (M-H, Fixed, 95% CI)	0.99 [0.44, 2.24]
1.5.2 Continuous infusion	5	382	Risk Ratio (M-H, Fixed, 95% CI)	0.75 [0.30, 1.89]
1.6 Time to first mobilization	3	208	Mean Difference (IV, Fixed, 95% CI)	-10.80 [-12.83, -8.77]
1.7 Costs of analgesic drugs	1	75	Mean Difference (IV, Fixed, 95% CI)	-4.40 [-4.84, -3.96]

Analysis 1.1. Comparison 1: Peripheral nerve blocks (PNBs) versus no nerve block (or sham block), Outcome 1: Pain on movement within 30 minutes of block placement



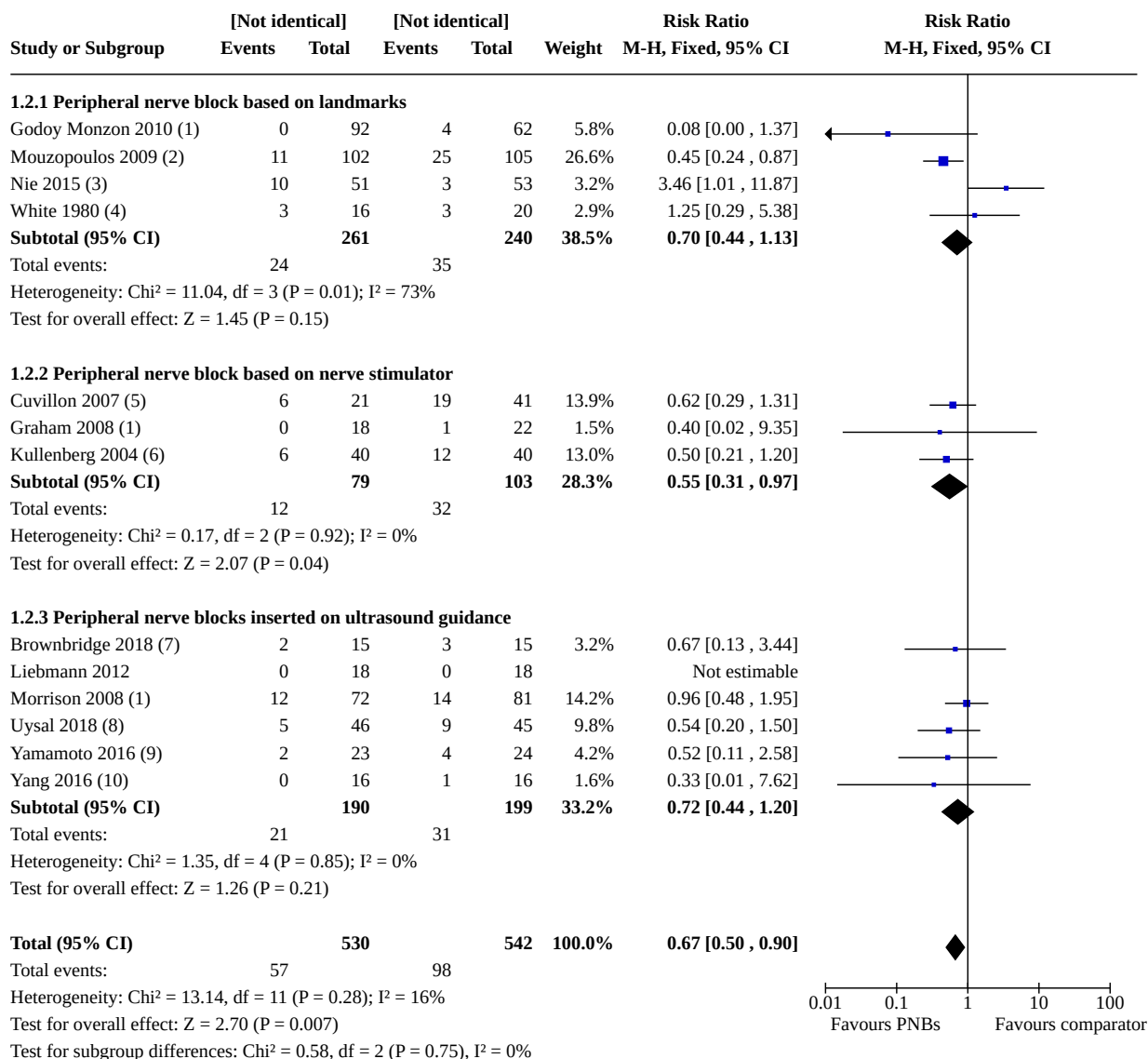
Footnotes

- (1) Landmarks (anatomical landmark i.e. in relation to a bony prominence or a pulsatile blood vessel)
- (2) No information on the localizing technique
- (3) Nerve stimulator
- (4) Dual technique: ultrasound guided (in-plane) plus nerve stimulator

Risk of bias legend

- (A) Bias arising from the randomization process
- (B) Bias due to deviations from intended interventions: Pain on movement within 30 minutes of block placement
- (C) Bias due to missing outcome data: Pain on movement within 30 minutes of block placement
- (D) Bias in measurement of the outcome: Pain on movement within 30 minutes of block placement
- (E) Bias in selection of the reported result: Pain on movement within 30 minutes of block placement
- (F) Overall bias: Pain on movement within 30 minutes of block placement

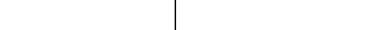
Analysis 1.2. Comparison 1: Peripheral nerve blocks (PNBs) versus no nerve block (or sham block), Outcome 2: Acute confusional state

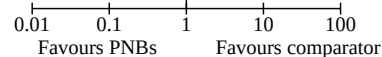


Footnotes

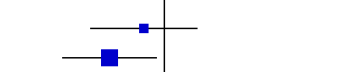
- (1) Blocks performed in the emergency department
- (2) Blocks started upon admission
- (3) Blocks performed after surgery only and operated 7.7 days after admission
- (4) Blocks performed intraoperatively and operated 3.5 days after admission
- (5) Catheters inserted after surgery and operated < 48 after admission
- (6) Blocks were performed immediately after X-Ray confirmation
- (7) Started shortly after admission
- (8) Repeated doses from admission to surgery for the intervention group, followed by epidural analgesia for both groups
- (9) Blocks performed in the operating room immediately before spinal block
- (10) Blocks performed immediately before anaesthesia induction

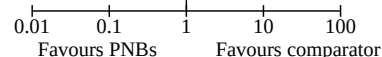
Analysis 1.3. Comparison 1: Peripheral nerve blocks (PNBs) versus no nerve block (or sham block), Outcome 3: Myocardial infarction

Study or Subgroup	[Not identical]		[Not identical]		Weight	Risk Ratio	Risk Ratio
	Events	Total	Events	Total		M-H, Fixed, 95% CI	M-H, Fixed, 95% CI
Altermatt 2013	0	14	0	17		Not estimable	
Total (95% CI)		14		17		Not estimable	
Total events:	0		0				
Heterogeneity: Not applicable							
Test for overall effect: Not applicable							
Test for subgroup differences: Not applicable							

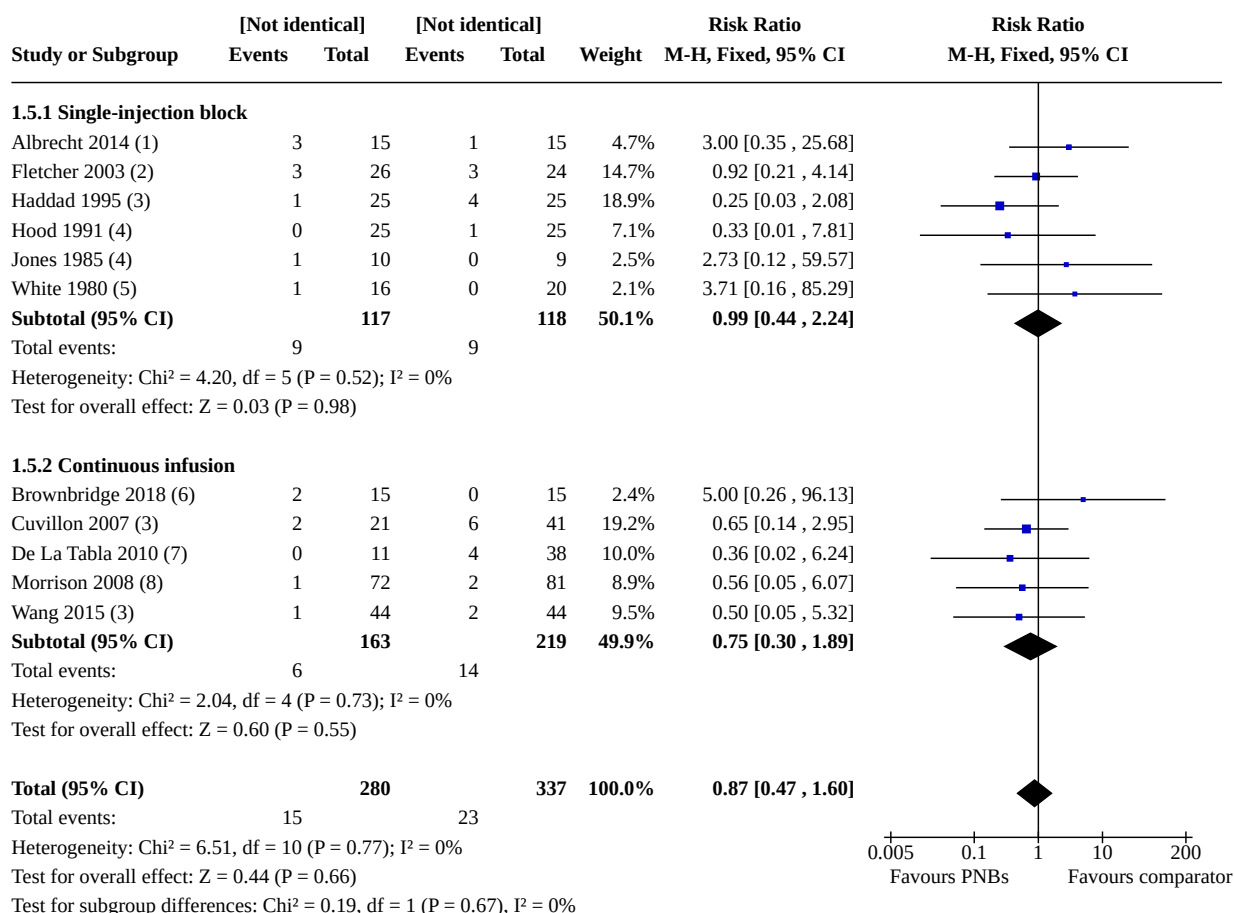


Analysis 1.4. Comparison 1: Peripheral nerve blocks (PNBs) versus no nerve block (or sham block), Outcome 4: Chest infections

Study or Subgroup	[Not identical]		[Not identical]		Weight	Risk Ratio		Risk Ratio	
	Events	Total	Events	Total		M-H, Fixed, 95% CI	M-H, Fixed, 95% CI		
Fletcher 2003	2	24	4	26	21.5%	0.54 [0.11 , 2.69]			
Haddad 1995	2	24	9	21	53.7%	0.19 [0.05 , 0.80]			
White 1980	3	16	5	20	24.9%	0.75 [0.21 , 2.67]			
Total (95% CI)		64		67	100.0%	0.41 [0.19 , 0.89]			
Total events:	7		18						
Heterogeneity: Chi² = 2.06, df = 2 (P = 0.36); I² = 3%									
Test for overall effect: Z = 2.24 (P = 0.03)									
Test for subgroup differences: Not applicable									



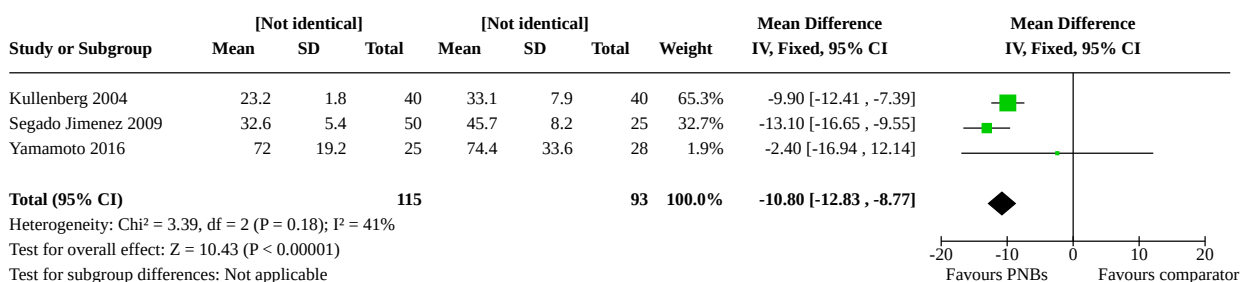
Analysis 1.5. Comparison 1: Peripheral nerve blocks (PNBs) versus no nerve block (or sham block), Outcome 5: Mortality



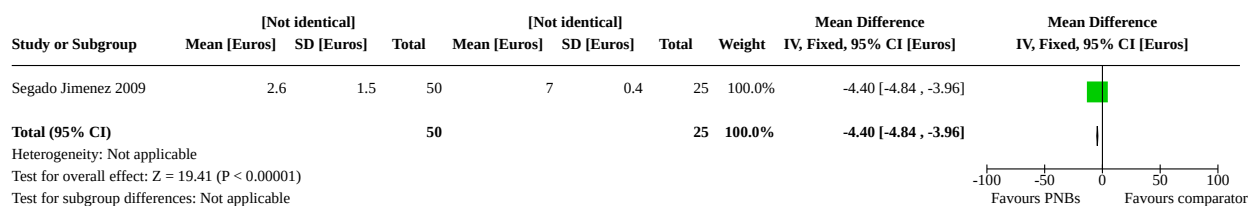
Footnotes

- (1) Mortality at 3 months
- (2) Mortality at 6 months
- (3) Mortality in hospital
- (4) Mortality at 24 hours
- (5) Mortality at 28 days
- (6) Mortality at 30 days
- (7) Mortality at 1 month
- (8) Mortality at 6 weeks

Analysis 1.6. Comparison 1: Peripheral nerve blocks (PNBs) versus no nerve block (or sham block), Outcome 6: Time to first mobilization



Analysis 1.7. Comparison 1: Peripheral nerve blocks (PNBs) versus no nerve block (or sham block), Outcome 7: Costs of analgesic drugs



ADDITIONAL TABLES

Table 1. Anaesthetic techniques

Study	Purpose of blockade	Time of block placement	Surgical anaesthesia	Block technique	Comparison	Supplemental analgesia for both groups
Albrecht 2014	Preoperative analgesia	In the emergency department	No information	Fascia iliaca compartment block Landmarks Single injection Bupivacaine 0.5% with epinephrine 1:200,000 30 mL Operator: trained emergency physicians	Sham block with normal saline	Acetaminophen Morphine
Altermatt 2013	Preoperative, intraoperative, and postoperative analgesia	Preoperatively, probably in the emergency department	Spinal anaesthesia	Psoas compartment block Nerve stimulator (quadriceps contraction at 0.5 mA, 1 Hz, 0.1 millisecond) Continuous infusion Bupivacaine 0.1% 20 mL followed by patient-controlled analgesia: basal rate 8 mL/hour, bolus 5 mL, lock-out time 30 minutes for 72 hours Operator: no information	No nerve block IV PCA with Morphine	Acetaminophen Ketorolac
Antonopoulou 2006	Postoperative analgesia	After recovery of anaesthesia	Spinal anaesthesia	Femoral nerve block Nerve stimulator Continuous infusion Levobupivacaine 0.25% 18 mL followed by levobupivacaine 0.125% at 3 to 4 mL/hour for 24 hours after surgery Operator: no information	No nerve block	Acetaminophen Pethidine

Table 1. Anaesthetic techniques (Continued)

Bang 2016	Postoperative analgesia	After surgery and after confirmation of patient's mental status to be alert, able to communicate, and obey commands	Spinal anaesthesia	Fascia iliaca compartment block Ultrasound-guided Single injection Ropivacaine 0.2% 40 mL Operator: no information	No nerve block	Ketorolac Celecoxib IV PCA with Fentanyl Tramadol
Brown-bridge 2018	Preoperative, intra-operative, and post-operative analgesia	Preoperatively, after patients had been assigned to a bed on the ward	Spinal (53% for intervention group and 40% for comparator group) or general anaesthesia	Fascia iliaca compartment block Landmarks Continuous infusion Ropivacaine 0.125% 40 mL followed by ropivacaine 0.2% 10 mL/hour until surgery. In the operating room, catheters were re-bolused with 40 mL 0.125% ropivacaine, then removed Operator: anaesthesiology department	No nerve block	Acetaminophen NSAIDs Opioids
Chudinov 1999	Preoperative, intra-operative, and post-operative analgesia Surgery for some participants	Preoperatively, within 6 hours after admission to the orthopaedic ward	Intervention: psoas block alone (3/20) with sciatic block (5/20), spinal (11/20) or general anaesthesia (1/20) Comparator: neuraxial block (19/20) or general anaesthesia (1/20)	Psoas compartment block Landmarks and loss of resistance to air, lateral decubitus with operated side up (1 epidural spread) Continuous infusion: started preoperatively (16 to 48 hours) and kept for 72 hours after surgery Test dose with 3 mL of 0.5% bupivacaine with epinephrine 5 mcg/mL followed by bupivacaine 0.25% with epinephrine 5 mcg/mL 0.8 mL/kg over 8 minutes plus 1 to 2 mg/kg routinely every 8 hours and before surgery (unless already received < 3 hours) Operator: anaesthesiologists	No nerve block IM Meperidine Diclofenac	IM Meperidine
Coad 1991	Postoperative analgesia	At completion of surgery before awakening from general anaesthesia	General anaesthesia	1) Lateral femoral cutaneous nerve block 2) 3-in-1 femoral nerve block Landmarks Single injection 1) Bupivacaine 0.5% with epinephrine 5 mcg/mL 15 mL 2) Bupivacaine 0.5% with epinephrine 5 mcg/mL 15 mL Operator: anesthesiology department	No nerve block	Pethidine

Table 1. Anaesthetic techniques (Continued)

Cuvillon 2007	Postoperative analgesia	After ending of effects of spinal blockade	Spinal anaesthesia	<p>Femoral nerve block</p> <p>Nerve stimulator (quadriceps for patella ascension with 0.3 to 0.5 mA at 0.1 ms and catheter 10 to 15 cm passed over the needle tip)</p> <p>Continuous infusion</p> <p>Lidocaine 1.5% plus epinephrine 30 mL of lidocaine 1.5% followed by ropivacaine 0.2% at 10 mL/hour for 48 hours</p> <p>Operator: anesthesiology department</p>	<p>No nerve block</p> <p>IV Paracetamol for half of participants in the comparator group</p>	<p>1 dose of paracetamol in the emergency department</p> <p>Morphine</p>
De La Tabla 2010	Preoperative, intraoperative, and postoperative analgesia	Upon hospital arrival	No information	<p>Femoral nerve block</p> <p>Dual technique: ultrasound-guided plus nerve stimulator</p> <p>Continuous infusion</p> <p>Ropivacaine 0.2% 15 mL followed by ropivacaine 0.2% at 5 mL/hour basal rate plus boluses of 10 mL every 30 minutes</p> <p>Operator: no information</p>	<p>No nerve block</p> <p>IV Metamizole</p>	IV Tramadol
Deniz 2014	Intraoperative and postoperative analgesia	In the operating room, before induction of general anaesthesia	General anaesthesia	<p>1) Fascia iliaca compartment block</p> <p>2) 3-in-1 femoral nerve block</p> <p>1) Ultrasound-guided</p> <p>2) Dual technique: ultrasound-guided plus nerve stimulator (quadriceps contraction at 0.5 mA)</p> <p>Single injection</p> <p>1) Bupivacaine 0.25% 30 mL</p> <p>2) Bupivacaine 0.25% 30 mL</p> <p>Operator: anesthesiology department</p>	No nerve block	<p>Tenoxicam</p> <p>IV PCA with Tramadol</p>
Diakomi 2014	Spinal positioning, intraoperative and postoperative analgesia	Before positioning for spinal anaesthesia	Spinal anaesthesia	<p>Fascia iliaca compartment block</p> <p>Landmarks</p> <p>Single injection</p> <p>Ropivacaine 0.5% 40 mL</p> <p>Operator: anesthesiology department</p>	<p>No nerve block</p> <p>IV Fentanyl for positioning for spinal block</p>	IV PCA with Morphine
Domac 2015	Spinal positioning, intraoperative and postoperative analgesia	In the regional anaesthetic technique room, before spinal anaesthesia	Spinal anaesthesia	<p>Fascia iliaca compartment block</p> <p>Landmarks</p> <p>Single injection</p> <p>Bupivacaine 0.5% 15 mL and lidocaine 2% 15 mL</p>	No nerve block	<p>IV PCA with Morphine</p> <p>Tramadol</p>

Table 1. Anaesthetic techniques (Continued)

Operator: anesthesiology department						
Fletcher 2003	Preoperative analgesia	In the emergency department, after radiographic confirmation	No information	3-in-1 femoral nerve block Paraesthesia Single injection Bupivacaine 0.5% 20 mL	No nerve block	IV Morphine
Operator: trained emergency physicians						
Foss 2005a	Preoperative analgesia	Upon arrival in the emergency department	No information	Fascia iliaca compartment block Landmarks Single injection Mepivacaine 1% with epinephrine 5 mcg/mL 40 mL Operator: junior anaesthesiologists with less than 2 years of training	Sham block with 0.9% saline plus IM Morphine	IV Morphine Epidural analgesia after 3-hour study period
Gille 2006	Preoperative, intraoperative, and postoperative analgesia	Upon arrival in the emergency department	Intervention: spinal anaesthesia for 37/50 and general anaesthesia for 13/50 Comparator: spinal anaesthesia for 38/50 and general anaesthesia for 12/50	Femoral nerve block Nerve stimulator (0.5 mA and 0.1 millisecond) Continuous infusion (non-stimulating catheters advanced about 10 cm past the needle tip) Prilocaine 1% 40 mL followed 2 hours later by ropivacaine 0.2% 30 mL, repeated every 6 hours (up to 40 mL; N = 5) and at intervals (up to every 4 hours; N = 8) or both (N = 6), adjusted on pain scores Operator: anaesthesiology department	No nerve block IV Metamizole Oral Tilidine and Naloxone	Ibuprofen Tilidine
Godoy Monzon 2010	Preoperative analgesia	In the emergency department, after confirmation of diagnosis	No information	Fascia iliaca compartment block Landmarks Single injection Bupivacaine 0.25% 0.3 mL/kg Operator: physicians (first study author is an orthopaedic surgeon)	Sham block with saline and IV NSAIDs	NSAIDs Opioids
Graham 2008	Preoperative analgesia	In the emergency department	No information	Femoral (3-in-1) nerve block Single injection Nerve stimulator Bupivacaine 0.5% 30 mL (not exceeding 3 mg/kg)	No nerve block IV Morphine	IV Morphine Dihydrocodeine Diclofenac

Table 1. Anaesthetic techniques (Continued)

				Operator: specialist emergency physician or higher trainee resident, post intermediate examination level		Paracetamol
Gürtan Bölükbası 2013	Spinal positioning, intraoperative and postoperative analgesia	Before spinal anaesthesia	No information	Fascia iliaca compartment block Single injection Ultrasound-guided Levobupivacaine 0.375% 30 mL Operator: anaesthesiology department	No nerve block IV Remifentanyl	Additional analgesia
Haddad 1995	Preoperative analgesia	In the emergency department	No information	Femoral nerve block Single injection Bupivacaine 0.25% 0.3 mL/kg Paraesthesia technique with a short bevel needle Operator: 1 orthopaedic registrar	No nerve block	Co-dydramol Voltarol Pethidine
Henderson 2008	Preoperative analgesia	In the emergency department	No information	Femoral nerve block Nerve stimulator Single injection Bupivacaine 0.5% Operator: trained emergency physicians	No nerve block	Opioids
Hogg 2009	Spinal positioning, intraoperative and postoperative analgesia	Before spinal anaesthesia	Spinal anaesthesia	Fascia iliaca compartment block No information on localizing technique Single injection Lidocaine 1% 2 mg/kg Operator: anaesthesiology department	No nerve block IV Ketamine 0.2 mg/kg IV Midazolam 0.025 mg/kg	Ketamine
Hood 1991	Intraoperative and postoperative analgesia	Before induction of general anaesthesia	General anaesthesia	1) Femoral "3-in-1" nerve block 2) Infiltration above the iliac crest 1) Nerve stimulator (quadriceps contraction with < 1 mA) 2) Landmarks Single injection 1) Prilocaine 0.75% 35 mL 2) Prilocaine 0.75% 8 mL Operator: anaesthesiology department	No nerve block	Papaveratum
Jadon 2014	Spinal positioning, intraoper-	Before spinal anaesthesia	Spinal anaesthesia	Femoral nerve block	No nerve block	IV Fentanyl

Peripheral nerve blocks for hip fractures in adults (Review)

Table 1. Anaesthetic techniques (Continued)

	ative and postopera- tive analge- sia			Nerve stimulator (quadriceps contraction with 0.3 to 0.5 mA)	IV Fentanyl	
				Single injection		
				Lidocaine 1.5% (2% diluted with distilled water) with epinephrine 5 mcg/mL 20 mL		
				Operator: anaesthesiology department		
Jang 2018	Preopera- tive analge- sia	In the emer- gency de- partment, 48 hours before surgery	No infor- mation	Femoral nerve block Single injection Ultrasound-guided (in-plane) Bupivacaine 0.5% 0.3 mL/kg (maximum 20 mL) Operator: 1 physician experienced in ad- ministering ultrasound-guided femoral nerve blocks	Sham block with saline	IV Tra- madol
Jones 1985	Postopera- tive analge- sia	At com- pletion of surgery, while stil- l under gen- eral anaes- thesia	General anaesthe- sia	Lateral femoral cutaneous nerve block Single injection Landmarks Bupivacaine 0.5% with epinephrine 5 mcg/mL 15 mL Operator: anaesthesiology department	No nerve block	IM Pethi- dine
Kullenberg 2004	Preopera- tive analge- sia	As soon as the diagno- sis of hip fracture was radiological- ly confirmed	No infor- mation	Femoral nerve block Nerve stimulator Single injection Ropivacaine 0.75% 30 mL. Operator: 1 orthopaedic surgeon	No nerve block	Paraceta- mol Tramadol Ketobemi- don
Landsting 2008	Preopera- tive analge- sia	Within 1 hour of hos- pital admis- sion	No infor- mation	Fascia iliaca compartment block Landmarks Single injection Ropivacaine 0.2% 30 mL Operator: orthopaedic surgeons	Sham block with saline	IV Mor- phine Paraceta- mol
Liebmann 2012	Preopera- tive analge- sia	In the emer- gency de- partment	No infor- mation	3-in-1 femoral nerve block Ultrasound-guided (in-plane) Single injection Bupivacaine 0.5% 25 mL Operator: emergency physicians experi- enced with the technique	Sham block with saline	Morphine

Table 1. Anaesthetic techniques (Continued)

Luger 2012	Preoperative, intra-operative, and post-operative analgesia	In the emergency department	Spinal anaesthesia	Femoral "3-in-1" nerve block Ultrasound-guided Continuous infusion (catheters inserted \geq 12 to 15 cm past the needle tip) Bupivacaine 0.25% 30 mL (additional 10 mL if required for adequate sensory blockade) followed by bupivacaine 0.125% at 6 mL/hour Operator: anesthesiology department	No nerve block	Piritramide Paracetamol
Ma 2018a	Preoperative analgesia	After hospital admission	No information	Fascia iliaca compartment block Ultrasound-guided (in-plane) Continuous infusion (catheters 5 to 10 cm beyond the tip of the needle) Ropivacaine 0.4% 30 mL followed by ropivacaine 0.2% at 5 mL/hour plus 5 mL for breakthrough pain until surgery (mean 3.5 days). Catheters removed on the morning of surgery Operator: 1 anaesthesiologist experienced in ultrasound-guided nerve block	No nerve block	Tramadol Acetaminophen Pethidine
Madabushi 2016	Spinal positioning, intraoperative and postoperative analgesia	Before spinal anaesthesia	Spinal anaesthesia	Fascia iliaca compartment block Landmarks Single injection Ropivacaine 0.375% 30 mL Operator: anaesthesiologists	No nerve block IV Fentanyl	Paracetamol Tramadol Diclofenac
Morrison 2008	Preoperative analgesia, intra-operative and post-operative analgesia	In the emergency department for femoral nerve block and within 24 hours of femoral block for continuous fascia iliaca block	Regional anaesthesia for 62.1%	1) Femoral nerve block 2) Fascia iliaca compartment block (within 24 hours of #1) Ultrasound-guided (out-of-plane for insertion, but advancement visualized) 1) Single injection Bupivacaine 0.5% 20 mL 2) Continuous infusion Ropivacaine 0.2% 15 mL followed by 5 mL/hour for 72 hours after surgery Operators: 1) Trained emergency physicians 2) Anaesthesiologists (mobile peripheral nerve block service)	No nerve block	Opioids Acetaminophen

Table 1. Anaesthetic techniques (Continued)

Mosaffa 2005	Spinal positioning, intraoperative and postoperative analgesia	Before spinal anaesthesia	Spinal anaesthesia	Fascia iliaca block with 20 mL of 1.5% lidocaine No information for localizing technique Single injection Lidocaine 1.5% 20 mL Operator: anaesthesiology department	No nerve block IV Fentanyl	No information
Mouzopoulos 2009	Preoperative and postoperative analgesia	Started upon admission to the orthopaedic ward	Epidural anaesthesia	Fascia iliaca compartment blocks daily (from admission until surgery, restarted at 24 hours after surgery until discharge, stopped earlier (before or after surgery) if delirium occurred) Landmarks Bupivacaine 0.3 mL/kg (0.25%) Operator: orthopaedic surgeons	Sham blocks with water	IV Paracetamol Pethidine
Murgue 2006	Preoperative analgesia	In the emergency department	No information	Femoral nerve block Nerve stimulator (quadriceps contraction with patellar ascension) Single injection Mepivacaine 20 mL Operator: unclear, published by emergency physicians	No nerve block IV Morphine or IV Paracetamol and Ketoprofen	Nitrous oxide
Nie 2015	Postoperative analgesia	After closure of the surgical wound	General anaesthesia	Fascia iliaca block Landmarks Continuous infusion (catheter inserted \geq 10 cm cranially) Ropivacaine 0.5% according to body weight (20 mL if weight < 50 kg, 25 mL if weight 50 kg to 70 kg, 30 mL if weight > 70 kg) followed by ropivacaine 0.25% at 0.1 mL/kg/hour for 48 hours Operator: no information, probably anaesthesiology department	No nerve block IV PCA with Fentanyl	Acetaminophen Dihydrocodeine Morphine
Ranjit 2016	Spinal positioning, intraoperative and postoperative analgesia	Before spinal anaesthesia	Spinal anaesthesia	Femoral nerve block Dual technique: nerve stimulator plus in-plane ultrasound guidance Single injection Lidocaine 2% 20 mL Operator: anaesthesiology department	No nerve block IV Fentanyl	IV Fentanyl

Table 1. Anaesthetic techniques (Continued)

Segado Jimenez 2009	Postoperative analgesia	In post-anaesthesia care unit after full recuperation of motor blockade from the spinal block	Spinal anaesthesia	1) Lateral femoral cutaneous nerve block 2) Obturator nerve block Landmarks Single injections 1) Bupivacaine 0.5% with vasoconstrictor 5 mL 2) Bupivacaine 0.5% with vasoconstrictor 15 mL Operator: anaesthesiology department	No nerve block	IV Metamizole Dexketoprofen-trometamol Tramadol Morphine
Spansberg 1996	Postoperative analgesia	Catheters inserted before spinal anaesthesia Administration of local anaesthetics started after surgery	Spinal anaesthesia	Femoral nerve block Nerve stimulator Continuous infusion (non-stimulating catheter advanced 8 to 15 cm past needle tip) Bupivacaine 0.5% 0.4 mL/kg followed by bupivacaine 0.25% at 0.14 mL/kg/hour for 16 hours after surgery Operator: anaesthesiology department	Sham block with saline	Morphine Acetylsalicylic acid
Szucs 2010	Preoperative, intraoperative, and postoperative analgesia	Catheters inserted in the emergency department Administration of local anaesthetics started during catheter installation	Spinal anaesthesia	Femoral nerve block Nerve stimulator (quadriceps contraction resulting in patellar movement with 0.4 mA and 0.1 millisecond) Continuous infusion (non-stimulating catheter, space dilated with 10 mL of lidocaine 2%, catheter advanced cephalad 3 cm past the needle tip) Bupivacaine 0.5% 10 mL followed by 0.25% bupivacaine at 4 mL/hour for 72 hours Bolus of 2% lidocaine 10 mL 15 minutes before positioning for spinal anaesthesia Operator: anaesthesiology department	No nerve block	Paracetamol Morphine
Thompson 2019	Intraoperative and postoperative analgesia	Immediately before induction of anaesthesia	General or spinal anaesthesia (38%)	Fascia iliaca compartment block Ultrasound-guided Single injection Ropivacaine 0.25% 30 mL Operator: a board-certified anaesthesiologist	No nerve block	Acetaminophen Tramadol Opioids
Tuncer 2003	Postoperative analgesia	After surgery and reversal of neu-	General anaesthesia	Femoral (3-in-1) nerve block Nerve stimulator (quadriceps contraction with patellar ascension with < 1 mA)	No nerve block	Tenoxicam

Table 1. Anaesthetic techniques (Continued)

		romuscular blockade		Continuous infusion (non-stimulating catheter advanced 4 to 5 cm past the needle tip)	IV PCA with Morphine	
				Lidocaine 2% with epinephrine 5 mcg/mL 30 mL followed by bupivacaine 0.125% patient-controlled analgesia: basal rate 4 mL/hour, boluses 3 mL, lockout time 20 minutes		
				Operator: probably anaesthesiology department		
Unneby 2017	Preoperative analgesia	Before surgery, as soon as possible after admission to the orthopaedic ward	No information	Femoral nerve block Nerve stimulator (quadriceps contraction) Single injection Levobupivacaine 0.25% 20 to 40 mL In case of delayed surgery or if otherwise necessary, participants could receive 1 additional block Operator: 36 anaesthesiologists with various training	No nerve block	Opioids
Uysal 2018	Preoperative analgesia	In the emergency department	Spinal anaesthesia	Femoral nerve block Dual technique: ultrasound-guided (in-plane) and nerve stimulator (quadriceps contraction) Repeated doses every 8 hours through a catheter Bupivacaine 0.25% 10 mL	No nerve block IV Paracetamol	IV Tramadol Epidural analgesia after surgery
Wang 2015	Preoperative, intraoperative, and postoperative analgesia	Upon admission, after radiographic confirmation of the diagnosis	Combined spinal-epidural anaesthesia	Fascia iliaca compartment block Ultrasound-guided (out-of-plane for needle insertion and in-plane for solution diffusion, injected cephalad) Continuous infusion (catheter inserted 5 to 10 cm past the needle tip) Ropivacaine 0.4% 50 mL followed by ropivacaine 0.2% at 5 mL/hour (plus 5 mL top-up doses) Operator: anaesthesiologist with experience in ultrasound-guided nerve block	Sham block with saline Paracetamol Tramadol	IVPCA with Sufentanil after surgery
White 1980	Intraoperative and postoperative analgesia	After induction of anaesthesia, before surgery	General anaesthesia	Psoas compartment block Landmarks Single injection Mepivacaine 2% 30 mL Operator: anaesthesiology department	No nerve block	Usual surgical care

Table 1. Anaesthetic techniques (Continued)

Yamamoto 2016	Spinal positioning, intraoperative and postoperative analgesia	Before spinal anaesthesia	Spinal anaesthesia	Fascia iliaca compartment block Ultrasound-guided Single injection Levobupivacaine 0.25% 40 mL Operator: an orthopaedic surgeon with extensive experience in this block procedure	No nerve block IV Acetaminophen	Diclofenac Rescue analgesics
Yang 2016	Intraoperative and postoperative analgesia	Catheter insertion and local anaesthetic administration started before induction of anaesthesia	General anaesthesia	Fascia iliaca compartment block Ultrasound-guided Continuous infusion Ropivacaine 0.33% 30 mL followed by 0.15% ropivacaine at 2 mL/hour plus a bolus of 30 mL 0.15% ropivacaine every 24 hours for 72 hours after surgery Operator: anaesthesiology department	No nerve block IV PCA with Sufentanil	Rescue analgesics
Yun 2009	Spinal positioning, intraoperative and postoperative analgesia	Before spinal anaesthesia	Spinal anaesthesia	Fascia iliaca compartment block Landmarks Single injection Ropivacaine 0.375% 30 mL Operator: 1 experienced anaesthesiologist	No nerve block IV Alfentanil	IV Alfentanil for spinal block Pethidine before spinal block and after surgery

G: gram.

h: hour.

IM: intramuscular.

IV: intravenous.

mA: milliAmpere.

mcg/mL: microgram/millilitre.

mg/kg: milligram/kilogram.

MHz: megahertz.

mL: millilitre.

msec: millisecond.

n: number.

NSAIDs: non-steroidal anti-inflammatory drugs.

PCA: patient-controlled analgesia.

SC: subcutaneous.

Table 2. Complications of blocks and/or analgesic techniques

Study	Complications related to regional anaesthesia	Complications related to analgesic technique
Albrecht 2014	Not reported	Not reported

Table 2. Complications of blocks and/or analgesic techniques *(Continued)*

Altermatt 2013	Not reported	Not reported
Antonopoulou 2006	<p>No complications such as motor block, local-haematoma or infection, inadvertent arterial puncture, direct nerve damage, and cardiovascular or neurological toxicity were observed</p> <p>Five participants had accidental removal of the catheter: 4 during the procedure or while the catheter was secured, and 1 while in the ward</p>	Not reported
Bang 2016	No patient developed any residual sensory-motor deficit during the postoperative period	<p>Patients in the non-block group had nausea (N=2) and pruritus (N=1), and 1 patient in the block group had nausea within the first 2 postoperative days</p>
Brownbridge 2018	Not reported	<p>Respiratory complications in 5 out of 15 participants for each group</p> <p>Opioid side effects after enrolment: 3/15 in the block group; 7/15 in the non-block group</p>
Chudinov 1999	<p>No major complications in group regional blockade were described. Three participants developed local erythema at the catheter insertion site at the end of the study period</p> <p>No signs of local anaesthetic toxicity were documented</p> <p>One participant developed bilateral blockade (L1-L3 on the opposite side)</p>	Not reported
Coad 1991	No complications related to nerve blocks and no case of prolonged motor blockade	Not reported
Cuvillon 2007	Four catheters were prematurely removed: 1 by a confused participant, 2 by nurses (unexplained fever), and 1 by a surgeon (unconfirmed suspicion of local anaesthetic toxicity) (ropivacaine blood level < 2 ng/mL)	More constipation (47% vs 19% for regional blockade)
De La Tabla 2010	Not reported	Not reported
Deniz 2014	<p>Hypotension occurred in 1 participant in the fascia iliaca compartment block group (1/20) and in 1 participant in the femoral nerve block group (1/20)</p> <p>There was no complication that might be relevant to fascia iliaca compartment block in our study</p> <p>In 1 case, prolonged (4 months) temporary motor and sensory neurological deficits occurred due to 3-in-1 block</p>	Hypotension occurred in 2 patients with IV patient-controlled analgesia (2/20), requiring stopping of IV patient-controlled analgesia
Diakomi 2014	<p>Complications such as local anaesthetic toxicity recorded as well (none reported in results section)</p> <p>Nor did complication rates vary between groups</p>	<p>Complications such as hypoventilation (breathing rate < 8 breaths/min) were recorded as well</p> <p>Moreover, the 2 groups did not differ in these parameters at any time point until study com-</p>

Table 2. Complications of blocks and/or analgesic techniques (Continued)

		pletion at 24 hours after surgery. Nor did complication rates vary between groups
Domac 2015	Not reported	Not reported
Fletcher 2003	Among study participants, none experienced adverse effects as a result of nerve block administration	No clinically important differences between groups with respect to pulse rate, oxygen saturation, or respiratory rate at any time interval. Oxygen saturation 94.87%
Foss 2005a	No side effects attributable to femoral nerve block were noted in any participants during their hospital stay	More participants ($P = 0.05$) in the morphine group were sedated at 180 minutes after block placement No difference in nausea and vomiting was noted between groups, with 3 participants in each group having these side effects Tendency towards lower saturation was noted in the opioid group at 60 and 180 minutes after the block despite oxygen supplementation ($P = 0.08$)
Gille 2006	One inadvertent arterial puncture and blood aspiration positive for 3 participants Two transient paraesthesias No catheter site infection Ten catheters accidentally removed No severe complications related to analgesia	No respiratory depression from systemic analgesia and no allergic reactions All complications were reversible
Godoy Monzon 2010	The only complications were local bruises at the site of injection	Two participants with nausea and 2 with nausea and vomiting
Graham 2008	No immediate complications occurred in either group defined as inadvertent vascular puncture, anaphylaxis or collapse, severe pain, or inability to tolerate the procedure	No immediate complications were noted in either group
Haddad 1995	No local or systemic complications of femoral nerve blocks were noted	Not reported
Henderson 2008	No complications associated with femoral nerve block were noted	Not reported
Hogg 2009	One patient was withdrawn from the fascia iliaca compartment block group due to new-onset arrhythmia	Not reported
Hood 1991	No untoward sequelae were associated with nerve blocks All plasma prilocaine concentrations (maximum 3 pg/mL) were below the suggested threshold for toxicity for prilocaine of 6 pg/mL	Not reported
Jadon 2014	Not reported	In participants of fentanyl group, drowsiness was observed that required the presence of

Table 2. Complications of blocks and/or analgesic techniques (Continued)

		<p>more persons holding the participant during positioning</p> <p>SpO₂ was significantly lower in the fentanyl group ($P = 0.001$). However, no participant in either group had SpO₂ < 90% during the procedure</p> <p>Mean arterial blood pressure was significantly lower in the fentanyl group ($P = 0.0019$)</p>
Jang 2018	All femoral nerve block procedures required a single attempt and no complications were observed	Nausea and vomiting 4 vs 6, hypotension 2 vs 4, pruritus 0 vs 1, and desaturation 3 vs 2 for intervention and comparator, respectively
Jones 1985	No untoward sequelae associated with the nerve block were seen	Not reported
Kullenberg 2004	No complications related to the nerve blockade were noted in this study	Not reported
Landsting 2008	No serious adverse events due to the fascia iliaca compartment block were reported in this study	Not reported
Liebmann 2012	No other adverse events were noted during the study period, and no other adverse events were reported to study investigators	<p>Four-hour oxygen saturation (%) 96 (93 to 99) vs (%) 98 (95 to 99) for regional blockade</p> <p>Adverse events: Hypotension, number (%) 3 (17) vs number (%) 0 (0) for regional blockade Respiratory depression, number (%) 9 (50) vs number (%) 4 (22) for regional blockade Nausea/vomiting, number (%) 5 (28) vs number (%) 5 (28) for regional blockade</p> <p>One participant had an episode of rapid atrial fibrillation requiring diltiazem, but the participant had a history of chronic atrial fibrillation</p>
Luger 2012	Not reported	Not reported
Ma 2018a	<p>Two patients' catheters kinked. This problem was solved after the catheter was adjusted</p> <p>No other complications (local anaesthetic toxicity, puncture site infection, haematoma, catheter dislodgement) occurred</p>	<p>The occurrence of nausea and vomiting in group fascia iliaca compartment block were lower than those in group control.</p> <p>No patients experienced respiratory depression and over-sedation in 2 groups during the waiting period</p>
Madabushi 2016	No complications were noted in either group	No complications were noted in either group
Morrison 2008	There were no episodes of bleeding, falls, or catheter-related infections in the intervention group	Intervention participants were significantly less likely to report opioid side effects
Mosaffa 2005	Not reported	Not reported
Mouzopoulos 2009	No complications of femoral nerve block administration occurred, except 3 local haematomas developed at the injection site, which resolved spontaneously	Not reported

Table 2. Complications of blocks and/or analgesic techniques (Continued)

Murgue 2006	Not reported	Not reported
Nie 2015	No adverse effects such as pain at the insertion site or paraesthesia were observed No positive cultures were observed with the fascia iliaca block catheter tip, nor were any signs of infection noted in the current study	Not reported
Ranjit 2016	There was no inadvertent vascular puncture nor adverse effect of systemic local anaesthetic toxicity in the study group	SpO ₂ was significantly lower in the IV fentanyl group during positioning (95 vs 97; $P < 0.001$) and 5 minutes after (95 vs 98; $P < 0.001$). However, none of the patients in either group had their oxygen saturation below 90%
Segado Jimenez 2009	We did not observe any complications in the realization of regional anaesthetic techniques during or subsequent to these techniques	The incidence of side effects (sleepiness, hypotension, constipation, pruritus) was greater in the group with no block than in groups with blocks ($P < 0.01$)
Spansberg 1996	No haematomas at the site of femoral catheters	Two participants in each group experienced nausea and vomiting
Szucs 2010	For 1 participant, the elastomeric pump failed, resulting in local anaesthetic administered over less than 54 hours instead of 72 hours, and another participant, suffering from acute confusional state, disconnected his pump after 12 hours	The incidence of nausea/vomiting, pruritus, or excessive sedation was similar in the 2 groups
Thompson 2019	Of the 23 patients in group fascia iliaca compartment block, there were no intervention-related complications or adverse events. None of the patients receiving a block reported residual injection site pain, sensory or motor deficits, intravascular injections, cardiopulmonary events, or other adverse events	Not reported
Tuncer 2003	Not reported	Side effects (vomiting and pruritus) were observed significantly more frequently with intravenous analgesia
Unneby 2017	No adverse events related to the femoral nerve block were noted	Not reported
Uysal 2018	Not reported	Not reported
Wang 2015	The study group did not develop complications (local anaesthetic toxicity, puncture site infection, hematoma in preoperative waiting period)	All patients in the present study did not demonstrate symptoms of respiratory depression and excessive sedation in the preoperative waiting period Nausea 7 vs 12 and vomiting 5 vs 5 for intervention and comparator, respectively
White 1980	No participants showed any evidence of local anaesthetic toxicity	Not reported

Table 2. Complications of blocks and/or analgesic techniques (Continued)

Yamamoto 2016	Patients were also evaluated for potential drug- or block-related complications during the course of the trial No complications	Patients were also evaluated for potential drug- or block-related complications during the course of the trial No complications
Yang 2016	Not reported	Fewer side effects for fascia iliaca compartment block group Nausea and vomiting 0 vs 3, respiratory depression 0 vs 1 for intervention and comparator, respectively
Yun 2009	No adverse systemic toxicity of ropivacaine was noted, and neither vascular puncture nor paraesthesia was elicited No complications such as haematoma or persistent paraesthesia were observed in participants with a femoral nerve block within 24 hours after the operation	Hypoventilation (ventilatory rate 6 to 8/min) or pulse oximetric desaturation (oxygen saturation 88% or 89%) was encountered in 4 participants (20%) in the intravenous analgesia group. This was reverted with assisted manual mask ventilation All participants in the intravenous group experienced mild dizziness, and mild drowsiness was present in 12/20 of them

Brief summary: For peripheral nerve block, there was no case of systemic local anaesthetic toxicity and no infection. One case of prolonged (4 months) temporary motor and sensory neurological deficit occurred due to a 3-in-1 block (Deniz 2014). One new-onset arrhythmia was reported (Hogg 2009). Four cases of respiratory depression requiring face mask ventilation were reported with intravenous analgesia (Yun 2009). Other opioid side effects such as drowsiness, hypoventilation, desaturation, hypotension, nausea and vomiting, pruritus, and constipation were reported in both groups. No allergic reaction was reported.

%: percentage.

L: litre.

mg: milligram.

min: minute.

ng/mL: nanogram/millilitre.

pg/mL: picogram/millilitre.

APPENDICES

Appendix 1. Search strategies

MEDLINE ALL (Ovid) 1946 to 15 November 2019

1 exp Femoral Fractures/

2 exp Hip Fractures/

3 ((hip* or fem*r* or trochant* or pertrochant* or intertrochant* or subtrochant* or intracapsular* or extracapsular*) adj5 fracture*).mp.

4 1 or 2 or 3

5 exp Anesthesia/

6 exp nerve block/

7 ((an?est* or analg*) adj5 (regional* or local* or block* or nerv*)).mp.

8 (((nerv* or plexus or femoral or femur* or psoas or compartment or regional) adj3 block*) or lumbar plexus or fascia iliac*).mp.

9 5 or 6 or 7 or 8

10 ((randomized controlled trial or controlled clinical trial).pt. or random*.ab. or placebo.ab. or drug therapy.fs. or trial.ab. or groups.ab.) not (animals not (humans and animals)).sh.

11 Meta-analysis.pt. or exp Meta-analysis/ or exp Meta-analysis as topic/ or (meta analy* or metaanaly*).tw. or ((review* or search*) adj10 (literature* or medical database* or medline or pubmed or embase or cochrane or cinahl or biosis or current content* or systemat*)).tw.

12 10 or 11

13 4 and 9 and 12

Embase (Ovid) 1974 to 2019 November 13

1 exp femur fracture/

2 exp hip fracture/

3 ((hip* or fem*r* or trochant* or pertrochant* or intertrochant* or subtrochant* or intracapsular* or extracapsular*) adj5 fracture*).mp.

4 1 or 2 or 3

5 exp regional anesthesia/

6 exp nerve block/

7 ((an?est* or analg*) adj5 (regional* or local* or block* or nerv*)).mp.

8 (((nerv* or plexus or femoral or femur* or psoas or compartment or regional) adj3 block*) or lumbar plexus or fascia iliac*).mp.

9 5 or 6 or 7 or 8

10 (randomized controlled trial/ or crossover procedure/ or double blind procedure/ or single blind procedure/ or controlled clinical trial/ or ((single or double or triple or treble or doubly or singly) adj2 (blind* or mask*)).ti,ab. or (controlled adj5 (study or design or trial)).ti,ab. or (parallel group* or open label).ti,ab. or (allocat* or assign* or crossover* or cross over* or multicenter* or multi center* or placebo* or random* or factorial or volunteer* or (trial or groups)).tw.) not ((exp animal/ or animal.hw. or nonhuman/) not (exp human/ or human cell/ or (human or humans).ti,ab.))

11 4 and 9 and 10

CENTRAL (Cochrane Library)

#1 MeSH descriptor: [Hip Fractures] explode all trees

#2 MeSH descriptor: [Femoral Fractures] explode all trees

#3 (hip* or femor* or femur* or trochant* or pertrochant* or intertrochant* or subtrochant* or intracapsular* or extracapsular*) NEAR fracture*

#4 #1 OR #2 OR #3

#5 MeSH descriptor: [Anesthesia] explode all trees

#6 MeSH descriptor: [Nerve Block] explode all trees

#7 ((anesth* or anaesth* or analg*) NEAR (regional* or local* or block* or nerv*))

#8 ((nerv* or plexus or femoral or femur* or psoas or compartment or regional) NEAR block*) or lumbar plexus or fascia iliac*

#9 #5 or #6 or #7 or #8

#10 #4 and #9

#11 #10 in Trials

CINAHL (Ebsco)

S1	(MH "Femoral Fractures+")
S2	(MH "Hip Fractures+")
S3	TX ((hip* or femur* or femoral* or trochant* or pertrochant* or intertrochant* or subtrochant* or intracapsular* or extracapsular*) N5 fracture*)
S4	S1 OR S2 OR S3

Peripheral nerve blocks for hip fractures in adults (Review)

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(Continued)

S5	(MH "Anesthesia+")
S6	(MH "Nerve Block+")
S7	TX ((anesth* or anaesth* or analg*) N5 (regional* or local* or block* or nerv*))
S8	TX (((nerv* or plexus or femoral or femur* or psoas or compartment or regional) N3 block*) or lumbar plexus or fascia iliac*)
S9	S5 OR S6 OR S7 OR S8
S10	S4 AND S9
S11	((MH "Randomized Controlled Trials") OR (MH "Clinical Trials+") OR (MH "Random Assignment") OR (MH "Prospective Studies+") OR (MH "Clinical Trial Registry") OR (MH "Double-Blind Studies") OR (MH "Single-Blind Studies") OR (MH "Triple-Blind Studies") OR (MH "Multicenter Studies") OR (MH "Placebos") OR (PT Clinical trial) OR (MH "Quantitative Studies")) OR TX (random* or placebo* or trial* OR cross over OR crossover) OR TX ((singl* OR doubl* OR trebl* OR tripl*) N3 (blind* OR mask*)) OR TX (clinic* N1 trial*)
S12	S10 AND S11

Appendix 2. Risk of bias assessment

Supplement to [Methods](#).

For bias due to the randomization process, we evaluated allocation sequence generation, allocation sequence concealment, and baseline imbalances suggesting a problem in the randomization process.

For bias due to deviations from intended interventions, we evaluated the effect of assignment to intervention. To assess the effect of assignment to intervention, we evaluated if participants were aware of their assigned intervention during the trial, if carers and people delivering the interventions were aware of participants' assigned intervention during the trial, if there were deviations from the intended intervention that arose because of the trial context, if these deviations were likely to have affected the outcome, if these deviations from the intended intervention were balanced between groups, if an appropriate analysis was used to estimate the effect of assignment to the intervention, and if there was potential for a substantial impact (on the result) of the failure to analyse participants in the groups to which they were randomized.

For bias due to missing outcome data, we evaluated if data for this outcome were available for all, or nearly all, participants randomized, if there was evidence that the result was not biased by missing outcome data, if missingness in the outcome could depend on its true value, and if it was likely that missingness in the outcome depended on its true value.

For bias due to measurement of the outcome, we evaluated if the method of measuring the outcome was inappropriate, if measurement or ascertainment of the outcome could have differed between intervention groups, if outcome assessors were aware of the intervention received by study participants, if assessment of the outcome could have been influenced by knowledge of intervention received, and if it was likely that assessment of the outcome was influenced by knowledge of intervention received.

For bias due to selection of the reported result, we evaluated if the data that produced this result were analysed in accordance with a pre-specified analysis plan that was finalized before unblinded outcome data were available for analysis, and if the numerical result being assessed was likely to have been selected from multiple eligible outcome measurements or multiple eligible analyses of the data.

Appendix 3. Diagnostic criteria for acute confusional state

Study ID	Diagnostic criteria
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(Continued)

Brownbridge 2018	CAM-ICU scoring system will be used daily to measure delirium (time frame: during hospital stay up to 1 month)
Cuvillon 2007	Clinical evaluation "somnolence-confusion" and Mini Mental Test
Godoy Monzon 2010	"episodes of delirium"
Graham 2008	"acute confusional state"
Kullenberg 2004	Pfeiffer test, graded according to a 4-degree scale (0 to 3: no, light, moderate, and pronounced confusion)
Liebmann 2012	"agitation or confusion"
Morrison 2008	Confusion Assessment Method daily supplemented by chart review
Mouzopoulos 2009	Perioperative delirium: syndrome defined using the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV), and Confusion Assessment Method (CAM) criteria "Daily patient assessments using the MMSE, DRS-R-98, and Digit Span test [assessment of attention, range 0 (no attention) to 42 (good attention)] were used to enable the DSM-IV and CAM diagnoses and assess delirium severity"; "CAM and DRS-R-98 assessments were continued once delirium was diagnosed"
Nie 2015	"The Confusion Assessment Method was used to diagnose delirium pre- and postsurgery"
Uysal 2018	"Delirium Rating Scale-R-98 (DRS-R-98)"
White 1980	"confusion"
Yamamoto 2016	"Delirium occurring within 24 hour after surgery was diagnosed by the Confusion Assessment Method"
Yang 2016	"delirium"

Appendix 4. Diagnostic criteria for myocardial infarction

Study ID	Diagnostic criteria
Altermatt 2013	Serial electrocardiograms and troponin concentration measurements were performed daily until postoperative day 3, or more frequently if an ischaemic episode was suspected

Appendix 5. Diagnostic criteria for chest infection

Study ID	Diagnostic criteria
Fletcher 2003	"lower respiratory tract infections"
Haddad 1995	"chest infections which required antibiotics"

(Continued)

White 1980

"pneumonia"

Appendix 6. Results from other recent reviews on the topic published in English

Review	Pain	Acute con- fusalional state	Myocardial infarction	Chest infec- tions	Death	Time to first mobi- lization	Cost of analgesic regimen	Remarks
Amin 2017	FICB is safe and effective in controlling peri-operative pain	N/A	N/A	N/A	N/A	N/A	N/A	NR 25 trials
Dizdarevic 2019	Utilize various strategies to reduce pain including RA	N/A	N/A	N/A	N/A	N/A	N/A	NR
Fadhlillah 2019	FICB reduces acute pain on movement Variable results for pain at rest	N/A	N/A	N/A	N/A	N/A	N/A	MA 8 RCTs
Freeman 2016	FICB is part of recommended practices	Use mul- ti-modal analgesia to reduce the incidence of delirium	N/A	N/A	N/A	N/A	N/A	NR
Hards 2018	FICB is suitable for pre-hospital use and has few adverse effects Comparisons with systemic opioids are required	N/A	N/A	N/A	N/A	N/A	N/A	SR 7 studies: <ul style="list-style-type: none">• 1 RCT• 4 P• 1 R• 1 CR
Hartmann 2017	FNB seemed to be more effective than IV fentanyl	N/A	N/A	N/A	N/A	N/A	N/A	SR 2 RCTs
Hong 2019	FICB reduced pain at 1 to 8, 12, 24, and 48 hours No difference at 72 hours	N/A	N/A	N/A	N/A	N/A	N/A	MA 11 RCTs
Hsu 2018	Limited evidence for reduced pain on movement at 30 minutes and at 6 hours after surgery with FICB	N/A	N/A	N/A	N/A	N/A	N/A	MA 3 RCTs

(Continued)

No significant complications

Hsu 2019	FNB achieved lower pain scores on movement at 30 minutes than IV analgesia	N/A	N/A	N/A	N/A	N/A	N/A	MA 10 studies • 8 RCTs • 2 P
Parker 2016	N/A	N/A	N/A	N/A	Nerve blocks may reduce mortality or morbidity Continuing research is required	N/A	N/A	NR
Rashiq 2013	ONB plus LFCNB had the highest probability of being effective against acute postoperative pain More trials comparing multiple nerve blocks in hip fractures are required	FICB had the highest probability of being the most effective	N/A	N/A	N/A	N/A	N/A	SR 21 RCTs
Scurrah 2018	Consistent evidence that PNBs reduce pain and are more effective than standard systemic analgesia alone	Moderate evidence for a reduction	N/A	N/A	Limited evidence for a reduction	N/A	N/A	NR
Skjold 2019	Limited quantity of evidence for decreased pain scores leading to very low certainty of evidence supporting preoperative single-injection FNBs	N/A	N/A	N/A	N/A	N/A	N/A	SR with MA 5 RCTs
Soffin 2019	PNBs and non-opioid multi-modal analgesic agents are suggested preoperatively	N/A	N/A	N/A	N/A	N/A	N/A	ER
	FICB superior to opioids during movement Very few adverse effects	Insufficient evidence	N/A	N/A	Insufficient evidence	N/A	N/A	SR 11 studies

- 8 RCTs
- 3 qRCTs

(Continued)
Steenberg
2018

CR: Case report; ER: evidence review; FICB: fascia iliaca compartment block; FNB: femoral nerve block;
LFCNB: lateral femoral cutaneous nerve block; IV: intravenous; N/A: not a purpose of the review;
MA: meta-analysis; NR: narrative review; ONB: obturator nerve block; P: prospective non-randomized trial;
PNB: peripheral nerve block; qRCT: quasi-randomized controlled trial; RA: regional anaesthesia;
RCT: randomized controlled trial; R: retrospective trial; SR: systematic review.

WHAT'S NEW

Date	Event	Description
1 April 2021	Amended	Amendment: Risk of Bias (RobB-2) tables changed to interactive format.

HISTORY

Protocol first published: Issue 3, 1998

Review first published: Issue 2, 1999

Date	Event	Description
27 January 2021	Amended	Correction to the format of the Risk of Bias figures.
19 February 2020	New citation required and conclusions have changed	In this update, the conclusions and the certainty of evidence have changed for one outcome. There is now high certainty evidence for a reduction in acute confusional state with the use of peripheral nerve blocks. Previously (2017 update), there was very low certainty evidence of no difference in this outcome.
16 November 2019	New search has been performed	<p>The search was updated on 16 November 2019. Since the last version of this review (published in 2017), 18 new relevant randomized controlled trials including 1301 participants were published and have been included in this update.</p> <p>This review differs from the 2017 version by assessing the risk of bias of included trials with the risk of bias 2 tool. Two of the authors involved in the 2017 update withdrew from this update.</p>
1 December 2018	Amended	We reran the search 1 December 2018
16 August 2016	New citation required and conclusions have changed	<p>Two new authors joined the review</p> <p>We updated the search in June 2015</p> <p>We updated the review and brought the methods up-to-date</p> <p>We found 55 new studies: 20 included, 13 excluded and 22 ongoing. We left no studies awaiting classification</p>
16 August 2016	New search has been performed	We reran the search in August 2016
6 May 2015	New search has been performed	This review has been transferred to the Anaesthesia, Critical and Emergency Care Group by the Bone, Joint and Muscle Group
17 February 2009	New search has been performed	<p>For the second substantive update (Issue 2, 2009), we made the following changes.</p> <ol style="list-style-type: none"> 1. We included the following newly identified studies: Cuvillon 2007, Fletcher 2003, Foss 2005, Foss 2007, Gille 2006, Kullenberg 2004, Matot 2003, Murgue 2006 and Tuncer 2003. 2. We excluded the following studies: Gorodetskyi 2007, Mannion 2005, Marhofer 1998, Mutty 2007, Schiferer 2007, Turker 2003 and Piangatelli 2004. <p>We made no changes to the conclusions of the review</p>

Date	Event	Description
6 November 2008	Amended	We converted the review to new review format
21 November 2001	New citation required and conclusions have changed	In this substantive update (Issue 1, 2002), we included one newly identified study (Scheinin 2000). We made no changes to the conclusions of the review For details on all updates, please see 'Notes'

CONTRIBUTIONS OF AUTHORS

Joanne Guay: screened abstracts, searched websites, checked reference lists for new articles, selected new articles, retrieved relevant articles, graded articles for risk of bias, extracted data, analysed data, interpreted results, rated certainty of evidence, and drafted the update.

Sandra Kopp: screened abstracts, selected new articles, graded articles for risk of bias, extracted data, interpreted results, rated certainty of evidence, and drafted the update.

The contributions listed above refer to the 2020 version only. Please see previously published versions of this review for contributions of authors of earlier versions of this review.

DECLARATIONS OF INTEREST

Joanne Guay: no conflict of interest.

Sandra Kopp: no conflict of interest.

SOURCES OF SUPPORT

Internal sources

- University of Sherbrooke, Canada
University of Sherbrooke granted access to electronic databases and medical journals.
- University of Quebec in Abitibi-Temiscamingue, Canada
University of Quebec in Abitibi-Temiscamingue granted access to electronic databases and medical journals.
- Laval University, Quebec City, Quebec, Canada, Canada
Laval University granted access to electronic databases and medical journals.

External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

For this update, we made the following changes from the 2017 version.

- Instead of using the 'Risk of bias' tool, as we did in the 2017 version, we are now using the 'Risk of bias-2' (RoB 2) tool.
- For this update, we kept only the outcomes included in the summary of findings table of the previous version.

NOTES

For the first update (Issue 1, 2001), we made the following changes.

- Included study of [Chudinov 1999](#) on psoas compartment blocks.
- Changed methods score to include item 8.
- Changed statistical analysis to relative risks.
- Added a synopsis.

In the second update ([Parker 2002](#)), we excluded one newly identified study ([Van Leeuwen 2000](#)), and we included another ([Scheinin 2000a](#)). We have not made changes to the conclusions of the review.

We also updated this review in 2009. At that time, Cochrane updates did not earn a new citation unless they included new review authors or made a change to review conclusions.

For the 2016 update, we made the following changes.

1. Transferred this review to the Anaesthesia, Critical and Emergency Care Group from the Bone, Joint and Muscle Group.
2. Included two new review authors.
3. Updated the search in August 2016.
4. Updated the review and brought the methods up-to-date.
5. Excluded from the review studies evaluating neuraxial blocks (epidural/spinal) and wound infiltration as techniques of regional blockade.

For the 2020 update, we made the following changes.

1. Updated the search in November 2019.
2. Updated the review and brought the methods up-to-date.

INDEX TERMS

Medical Subject Headings (MeSH)

Anesthetics, Local [administration & dosage] [adverse effects]; Confusion [epidemiology] [prevention & control]; Early Ambulation; Hip Fractures [mortality] [*surgery]; Movement; Myocardial Infarction [epidemiology]; Nerve Block [adverse effects] [*methods]; *Pain Management; Pain Measurement; Pain, Postoperative [therapy]; Peripheral Nerves; Pneumonia [epidemiology]; Randomized Controlled Trials as Topic; Respiratory Tract Infections [prevention & control]; Time Factors

MeSH check words

Aged; Aged, 80 and over; Female; Humans; Male; Middle Aged